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Alaska Pulp Corporation Long-Term Timber Sale Contract

Kelp Bay Draft Environmental Impact Statement: Volume I

Kelp Bay
Draft Environmental Impact Statement

Alaska Pulp Corporation Long-Term Timber Sale Contract

U.S.D.A. - Forest Service
Alaska Region
Alaska

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Comments Must be Received:	Within 45 days when Notice of Availability of the Draft EIS is published in the Federal Register.

Abstract: Public comments are sought on this Draft EIS. The U.S. Forest Service proposes five alternatives to making timber volume available to the Alaska Pulp Corporation long-term timber sale contract. The Draft EIS describes themes for each alternative: (1) No Action, (2) to disperse activities, (3) to focus activities along Peril Strait, (4) to provide the least impact on non-timber resources, and (5) to provide the most volume while meeting standards and guidelines.

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Abstract

In compliance with Federal and State regulations, the U.S. Forest Service has prepared this Draft Environmental Impact Statement (Draft EIS) on the effects of making timber available from the Kelp Bay Project Area to the Alaska Pulp Corporation (APC) under its Long-term Timber Sale Contract Number 12-11-010-1545. The actions analyzed in this Draft EIS are designed to implement direction contained in the Tongass Land Management Plan, and the Tongass Timber Reform Act signed into law on November 28, 1990. The environmental effects considered in this analysis include the effects of timber harvest and road construction on other resources. It also includes the effects on timber production of meeting management objectives for non-timber resources including fisheries, wildlife, subsistence, recreation, culture, hydrology, soils, and visual quality.

The original contract between the Forest Service and the APC provided for sale of timber over a 50-year period, between 1961 and 2011. Under changes mandated by court decisions in the 1980s and the Tongass Timber Reform Act in 1990, timber is to be made available for harvest from smaller, contiguous areas as "timber offerings." The Kelp Bay Project Area is the first of many to be analyzed under this system.

Four alternatives for providing APC with timber under the contract requirements are provided. A No-action Alternative which calls for no timber harvest serves as a baseline against which to compare the alternatives proposing some action. Alternative 2 would distribute new harvest as widely as possible throughout the Project Area. It would harvest 136,209 million board feet (MMBF) of timber and provide for construction of 90 miles of new road and 30 miles of reconstructed road. Alternative 3 would concentrate harvest in the VCUs adjacent to Peril Strait, except for Lake Eva VCU, and would require 72 miles of new road and 23 miles of reconstructed road to harvest approximately 121,073 MMBF of timber. Alternative 4 would emphasize protection of non-timber resources by locating units in low risk areas and greater use of partial cuts and helicopter logging. Timber harvest would amount to approximately 86,355 MMBF of timber, with 61 miles of new road constructed and 25 miles of reconstructed road provided. Alternative 5 would harvest as much of the Kelp Bay Project Area as possible while still meeting laws and regulations. This would require 116 miles of new road and 34 miles of reconstructed road to harvest approximately 229,739 MMBF of timber.

Public comments are sought on this Draft EIS. Comments can be sent to the U.S. Forest Service, Tongass National Forest, Chatham Area, 204 Siginaka Way, Sitka, Alaska 99835. Comments relating to subsistence resources can also be given verbally at subsistence hearings to be held in Sitka and Angoon.

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Purpose and Need

Chapter 1

Purpose and Need

Introduction

In compliance with Federal and State regulations, the Forest Service branch of the U.S. Department of Agriculture has prepared a Draft Environmental Impact Statement (Draft EIS) for the Kelp Bay Project Area. This Draft EIS is divided into four chapters, as detailed in Figure 1-1, with supporting material included in Appendixes A through I.

Chapter 1 of the Draft EIS, Purpose and Need, presents the following:

- Project purpose
- Decisions to be made
- Project location
- Background
- How this Project relates to the Tongass Land Management Plan (TLMP)
- How the Kelp Bay Project Area was selected
- Issues being addressed
- Issues which will not be addressed
- Permits and licenses
- Legislation related to this EIS.

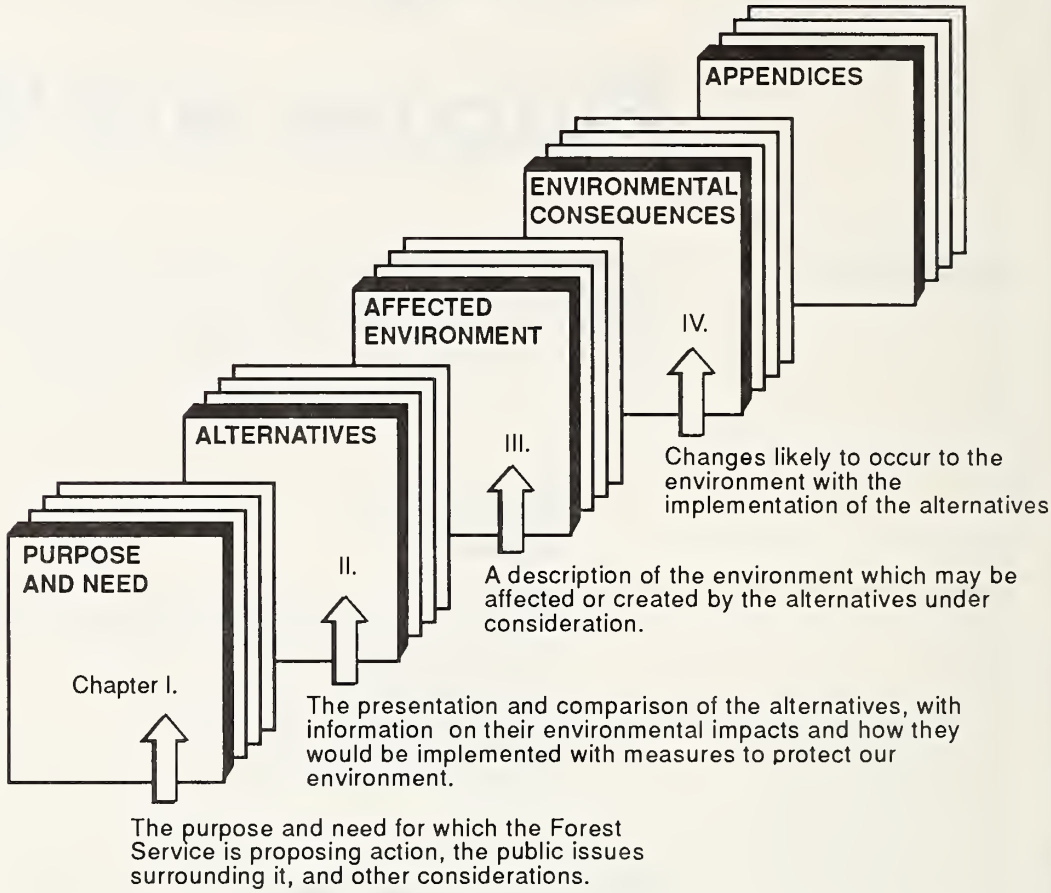
Project Overview

Project Purpose

In 1956, the Forest Service and Alaska Lumber and Pulp, now the Alaska Pulp Corporation (APC), entered into a timber sale contract for a 50-year period between 1961 and 2011. The purpose for the Kelp Bay Project is to make timber available in accordance with the APC Long-Term Timber Sale Contract Number 12-11-010-1545 (Forest Service, 1956). The Tongass Timber Reform Act (P.L. 101-626) recently mandated unilateral modifications to the contract. These changes are outlined later in this chapter.

The actions analyzed in this Draft EIS are designed to implement direction contained in the TLMP. Additional direction influencing the Kelp Bay Project is included in the Alaska Regional Guide and applicable Forest Service manuals and handbooks. The Forest Service planning team used a systematic, interdisciplinary process in developing a range of alternatives for timber harvest in the Kelp Bay Project Area. The Kelp Bay Project is the first of a series of timber harvest projects currently being considered within the APC contract boundary (Figure 1-2). These projects are designed to be consistent with TLMP direction. This EIS may result in one or more "timber offerings" to APC.

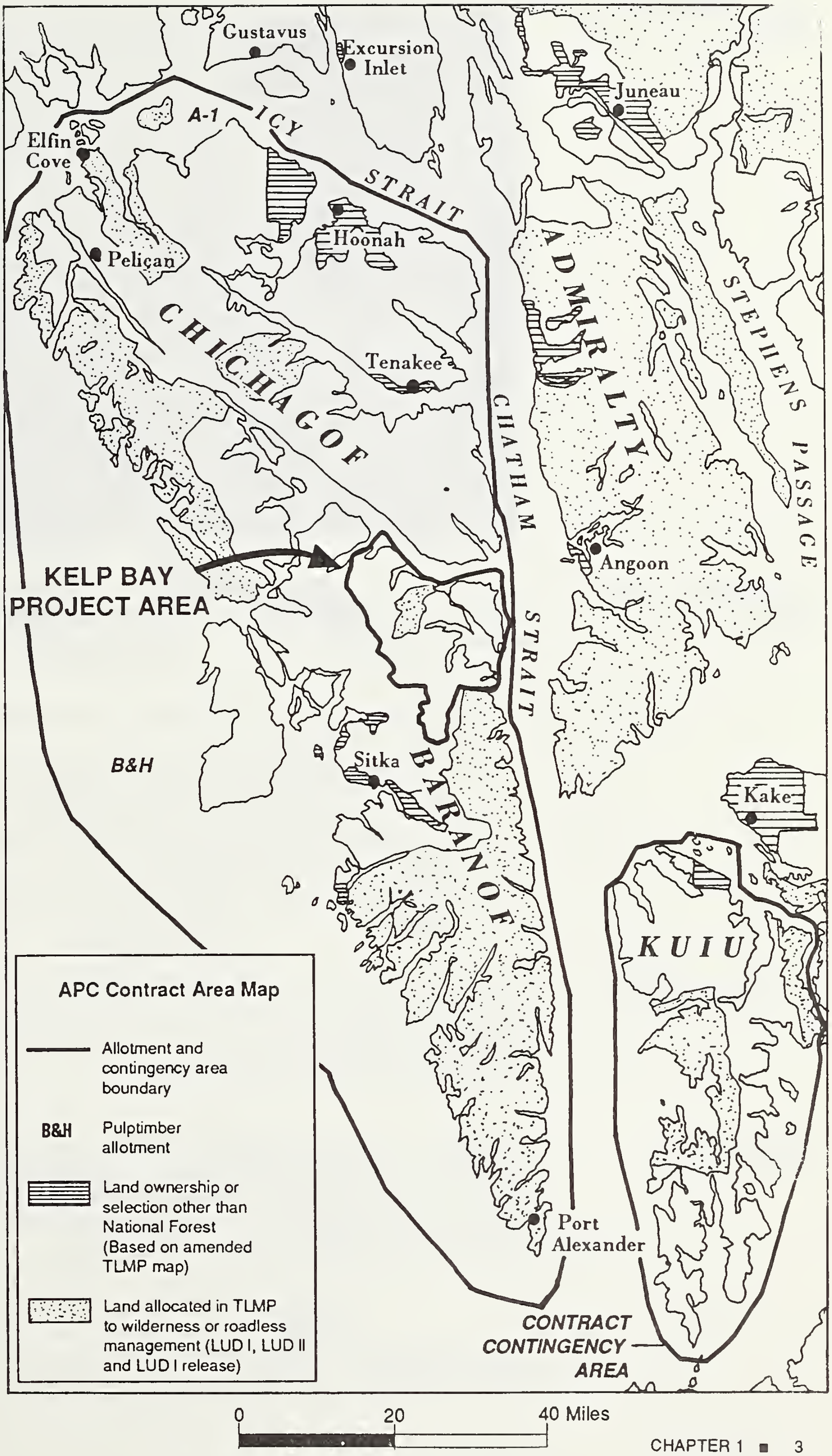
Figure 1-1
How This Draft EIS is Organized



The environmental effects to be considered during this analysis include the effects of timber harvest and road construction on other resources. The analysis also includes the effects on timber production of meeting management objectives for non-timber resources. The non-timber resources include fisheries, wildlife, subsistence, recreation, cultural, hydrology, soils, and visual quality (Morrison, 1989).

During the planning process, associated opportunities for the enhancement of fish and wildlife habitat and recreational opportunities were identified and are listed with each alternative description in Chapter 2. While these opportunities will be identified as part of the Kelp Bay Project, scheduling of any enhancement activities will be left for future evaluation (Morrison, 1989).

Figure 1-2
Contract Area Map



1 Purpose and Need

Historical view of the APC mill in 1958.

Decisions to be Made

Based on the environmental analysis, the Responsible Official (Michael A. Barton, Regional Forester, Forest Service, Alaska Region) will be deciding whether and how to make timber available from the Kelp Bay Project Area to meet contractual timber commitments. His decisions will include:

- The volume to make available under the contract in this area, in one or more "timber offerings;"
- The location and design of timber harvest units;
- The location and design of mainline and local road systems;
- The location and design of log transfer facilities;
- Necessary standards and guidelines, mitigation measures, and enhancement opportunities for resources other than timber; and
- Whether there may be a significant restriction on subsistence lifestyles (Morrison, 1990).

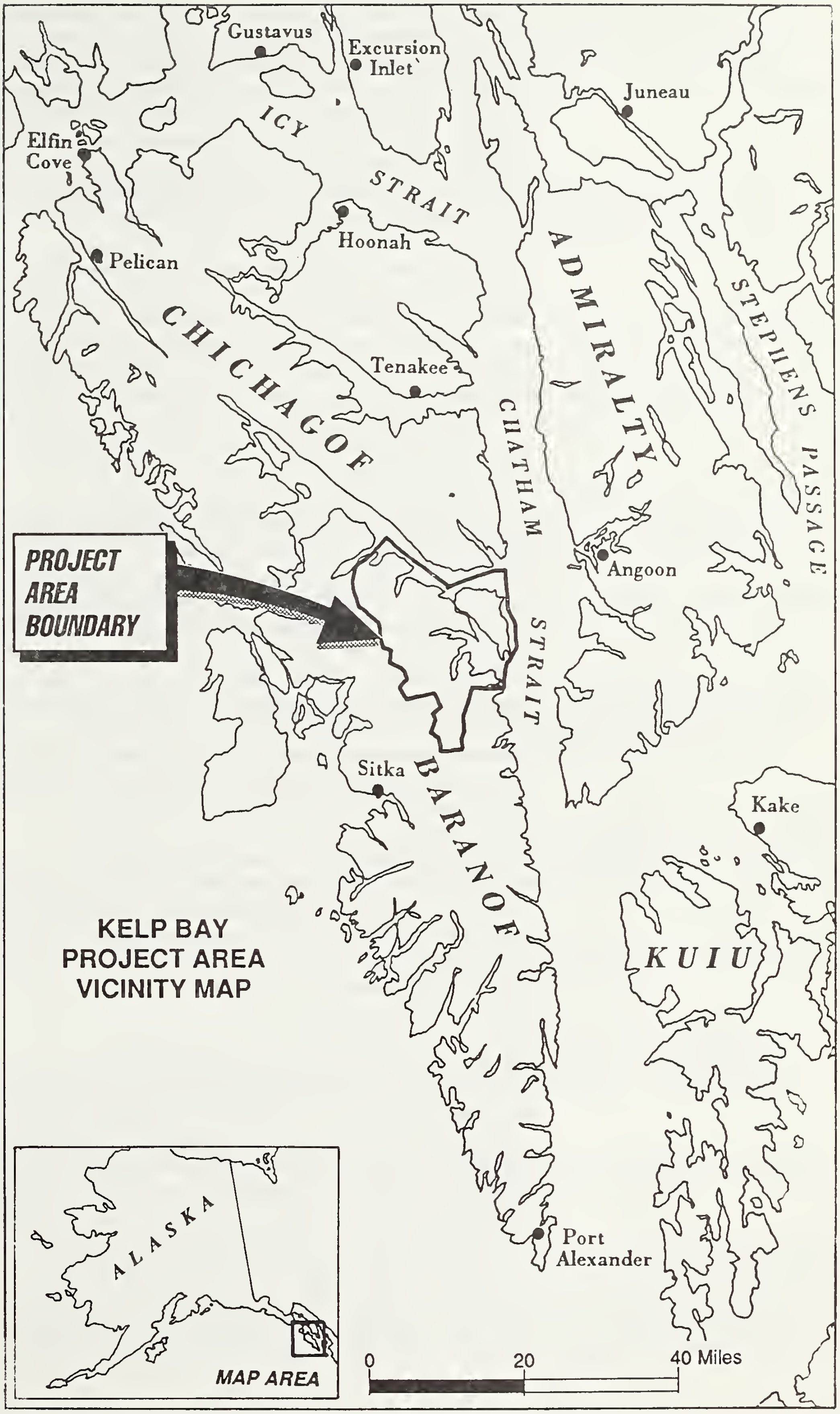
Project Location

The Kelp Bay Project Area is located in the northeast corner of Baranof Island, approximately 25 air miles northeast of Sitka and 65 air miles southwest of Juneau, and contains Tongass Land Management Plan Value Comparison Units (VCUs) 293, 294, 295, 296, 297, 298, 314, and 315 (Figure 1-3, vicinity map).

Background

In 1956, APC entered into a contract with the Federal Government prescribing terms for sale and logging of timber in Southeast Alaska for a 50-year period beginning in 1961 and ending in 2011. During that period, the contract provided for harvesting 4,974,700,000 board feet of timber within the sale or contract area, which includes parts of Baranof, Chichagof, Kuiu, and associated islands (Figure 1-2) (Forest Service, 1956).

Figure 1-3
Vicinity Map



1 Purpose and Need

Between 1971 and 1990, the Forest Service specifically planned and authorized logging, road construction, and related activities for successive 5-year periods. The Forest Service, through an agreement with the Sierra Club, determined that these 5-year Operating Plans were major Federal actions significantly affecting the human environment, thus requiring preparation of an EIS under the National Environmental Policy Act (NEPA). Since the enactment of NEPA, EISs have been prepared for the following 5-year periods: 1976 to 1981, 1981 to 1986, 1986 to 1990, and a supplemental EIS for the combined 1981 to 1990 period. The EIS for each 5-year period evaluates the proposed actions and the potential effects the Operating Plans may have upon the environment.

The Alaska Native Claims Settlement Act (ANCSA) (85 Stat. 688, as amended) was approved December 18, 1971, to provide for the settlement of certain land claims of Alaska Natives. The Alaska Native Claims Settlement Act has been the basis for conveying selected lands under administrative jurisdiction of the Tongass National Forest to Native Corporations (any regional, village, or urban corporation, or Native group). Under this Act, Native Corporations have selected more than 550,000 acres from the Tongass National Forest, and more than 515,000 acres of the land has been conveyed to them. The withdrawn and yet unconveyed lands remain in a state of suspension, unavailable for Native Corporation management and restricted from public management.

On December 2, 1980, the Alaska National Interest Lands Conservation Act (ANILCA), Public Law 96-487, was enacted to provide for the designation and conservation of certain public lands in the State of Alaska. This act established a number of areas to be preserved for the benefit, use, education, and inspiration of present and future generations. Title VII of the act resulted in 2,592,600 acres or about 32 percent of the Chatham Administrative Area becoming Wilderness. Another 17,200 acres became non-Wilderness National Monument. Title VIII of the act addressed the use of public lands for subsistence uses--the customary and traditional uses by rural Alaska residents of wild, renewable resources. In addition, Section 705(a) of the act provided funding to maintain a timber supply from the Tongass National Forest of 4.5 billion board feet per decade. The enactment of the Alaska National Interest Lands Conservation and the Alaska Native Claims Settlement Act changed the status of land administration in the Tongass National Forest.

During the 1980s a series of court challenges interrupted implementation of the 1981 to 1986 and 1986 to 1990 APC long-term timber sale EISs. During this time, controversy over management of the Tongass National Forest also became a national issue. In August 1989, the Forest Service and the APC, under the direction of the U.S. Department of Agriculture, renegotiated the terms of the APC contract. These terms met some of the public concerns. The result was two important changes in the method of environmental analysis for the 1990s (Forest Service, 1989a).

The first change requires the Forest Service to designate individual operating areas within the contract area boundary. The second change provides minimum and maximum limits for the timber volume to be made available each year to the APC. For the period 1991 through 1996, the minimum volume available would be 240 million board feet (MMBF). After 1996, the minimum volume rises to 360 MMBF available on an annual basis. The effect of these modifications is to allow the Forest Service to select operating areas within the APC contract boundary based on a variety of factors (Forest Service, 1989a).

On November 28, 1990, President Bush signed into law the Tongass Timber Reform Act (TTRA, P.L. 101-626). Among other provisions, Section 301 of this Act imposes unilateral changes to the long-term timber sale contract with APC to make it more consistent with independent national forest timber sale programs. These changes as provided in the Tongass Timber Reform Act are:

- assure that all timber sale planning, management requirements, and environmental assessment procedures regarding the contracts are consistent with procedures for independent national forest timber sales, pursuant to the National Forest Management Act of 1976 (Public Law 94-588), the National Environmental Policy Act of 1969 (42 USC 4321 et seq.) and other applicable laws;

- eliminate the practice of harvesting a disproportionate amount of old-growth timber by limiting the volume harvested over the rotation in Volume Classes 6 and 7, as defined in TLMP and supporting documents, so that the proportion of volume harvested in these classes within a contiguous Management Area does not exceed the proportion of volume currently represented by these classes within the management area;

- assure that all timber offered under each contract be substantially harvested within three years or the Secretary of Agriculture shall withhold further offerings pursuant to such contract, unless harvesting has been delayed by third-party litigation;

- assure that the Secretary determines the location and size of timber sale units and the timing of timber harvest;

- allow rejection of timber offered under the contracts. Upon rejection of any timber offered the Secretary may re-offer such timber to any qualified bidder under independent national forest timber sales. If the rejected timber is subsequently sold within 12 months, that amount of timber shall be subtracted from the volume remaining under the appropriate contract;

- assure that utility logs offered under the contracts shall be counted against contract volume requirements. As used in this paragraph the term "utility log" means the same as it does in the official Log Scaling and Grading Rule, Northwest Log Rules Advisory Group, January 1, 1982;

- assure that purchaser road credits are provided under the contracts in a manner consistent with independent national forest timber sale procedures;

- assure that the price of timber offered under the contracts shall be adjusted to be comparable with that of independent national forest timber sales, with stumpage rates and profitability criteria comparable to those of independent purchasers in competitive sales; and

- assure that timber offered under the contracts meets economic criteria consistent with that of independent national forest timber sales (P.L. 101-626).

Furthermore, Section 103 of the Tongass Timber Reform Act requires the maintenance of "a buffer zone of no less than one hundred feet in width on each side of all Class I streams in the Tongass National Forest, and on those Class II streams which flow directly into a Class I stream . . ." Class I streams provide habitat to anadromous fish and Class II streams provide habitat for resident fish. Commercial timber harvesting shall be prohibited within these

buffers. In addition, Best Management Practices (BMP) as defined in the Region 10 Soil and Water Conservation Handbook (Forest Service [D]) will be used to provide protection of riparian habitat on streams or portions of streams not protected by buffer zones described above (P.L. 101-626).

Consistent with unilateral changes resulting from Tongass Timber Reform Act and changes negotiated with APC that became effective July 1, 1990, timber is made available for harvest from smaller, contiguous timber offering areas. This is in contrast to preparing a single EIS for the entire contract area as was the case for the 5-year operating periods. Management requirements and the NEPA planning process will be consistent with that for the independent timber sale program.

How This Project Relates to Tongass Land Management Plan

The Kelp Bay Project would implement decisions which are consistent with the management direction of the current TLMP (completed in 1979, as amended in the winter 1985 to 1986, and again in February 1991 due to the Tongass Timber Reform Act). The Tongass Land Management Plan (TLMP) provides land and resource management direction for the Tongass National Forest. It establishes Land Use Designations (LUDs) to guide management of the land for certain uses. The LUDs describe activities that may be authorized as part of the management of a given area. The LUDs were assigned to areas known as Value Comparison Units (VCUs), which are roughly equivalent to large watersheds. Management Areas were then formed of one or more contiguous VCUs, allocated to LUDs I, II, or a combination of LUDs III and IV. Anticipated management activities were then scheduled for each Management Area.

The boundaries of a VCU usually follow easily recognizable watershed divides. In some cases, an island or a group of small islands comprise a single VCU. Figure 1-4 displays the relationships of these subunits (Forest Service, 1979b).

Land Use Designations

The three LUDs which apply to the Kelp Bay Project Area are summarized below (Forest Service, 1986b).

LUD II

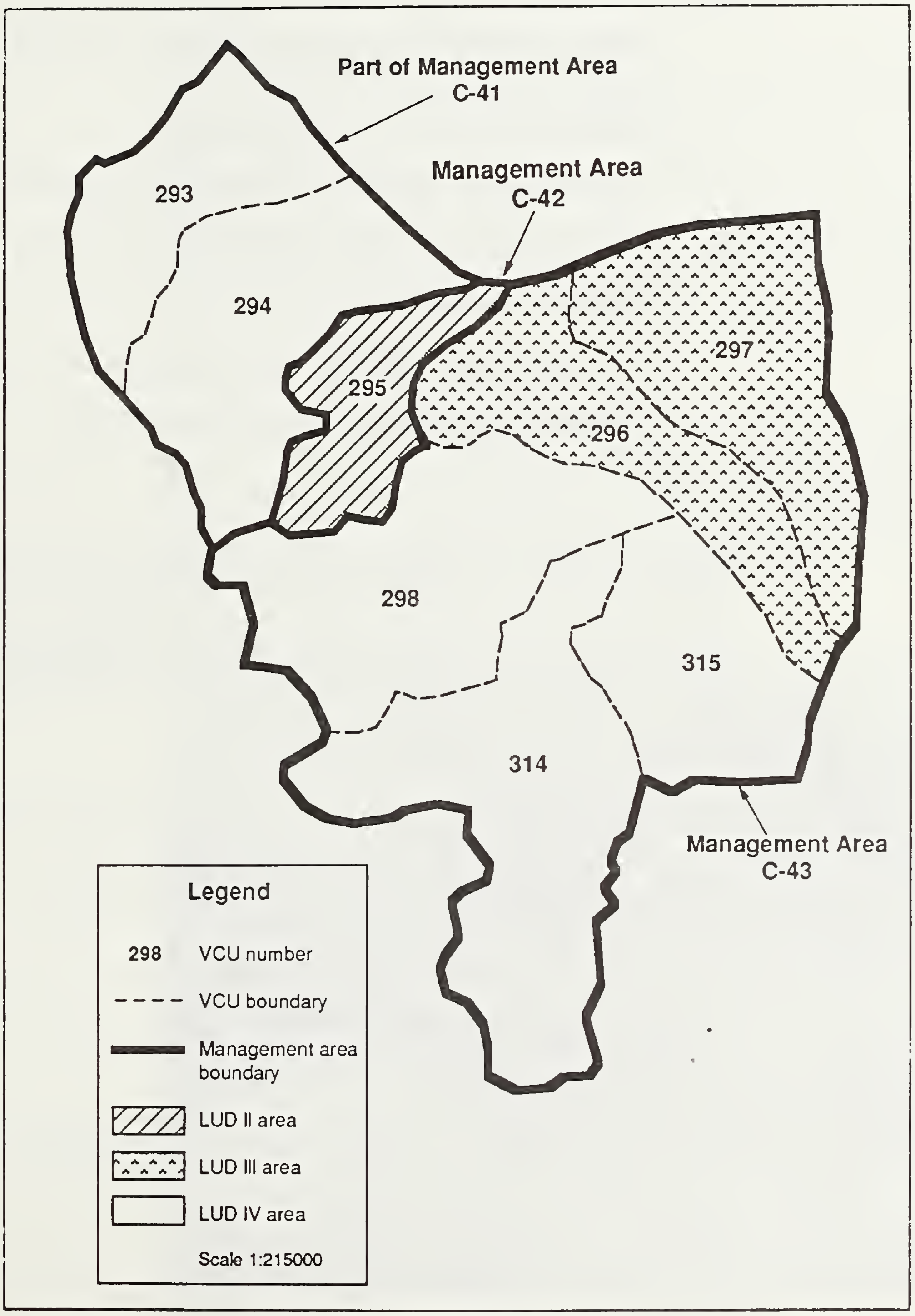
Areas allocated to LUD II are to be managed in a roadless state to retain their wildland character, but would permit wildlife and fish habitat improvement and primitive recreational facility development. Specific authorized activities include:

Personal use of wood is allowed for cabin logs, firewood, float logs, trolling poles, and other similar uses;

Water and power developments are permitted if they can be designed to retain the overall primitive characteristics of the allocated area; and

Roads can be built only to serve authorized activities such as mining, power and water development, aquaculture developments, transportation needs determined by the State of Alaska, and vital Forest Service transportation system linkages.

Figure 1-4
Map of VCUs



LUD III

Areas allocated to LUD III are to be managed for a variety of uses. The emphasis is on managing for both amenity and commodity oriented uses in a compatible manner to provide the greatest combination of benefits. These areas usually have high amenity values in conjunction with high commodity values. Allowances in calculated potential timber yield have been made to meet multiple-use coordination objectives. Specific authorized activities include:

- Potential timber yields will be reduced to the extent needed to protect important biological and aesthetic values;
- Both permanent and temporary roads are allowed;
- Roads are located and designed to retain important recreational and scenic qualities;
- Mineral development is subject to existing laws and regulations;
- Needed trails can be provided;
- A full range of recreational facilities is permissible; and
- A full range of fisheries improvement projects is permitted.

LUD IV

Areas allocated to LUD IV provide opportunities for intensive development of resources. Emphasis is primarily on commodity or market resources and their uses. Amenity values are also provided for. When conflicts regarding competing resource use arise, resolution most often would be in favor of commodity values. Allowances in calculated potential timber yield have been made to provide for protection of physical and biological productivity. Specific authorized activities include:

- Timber is to be harvested primarily by clearcutting;
- Potential timber yields are to be reduced only to the extent necessary to protect the biological and aesthetic values;
- Mineral development is subject to existing laws and regulations;
- Permanent or temporary roads may be built;
- Motorized use is permitted;
- A full range of recreational facilities is permitted;
- A full range of fisheries improvement projects is permitted; and
- Needed trails can be provided.

Management Areas

The TLMP, as amended, provides management direction which carries forward timber sale preparation in the Kelp Bay Project Area begun in the APC 1981 to 1986 operating period. It accomplishes this task by scheduling activities for two time periods. The first is the present (1985-1989) and the second is the future (1990-2019) (Forest Service [F]). Specific direction in the TLMP for the management areas comprising the Kelp Bay Project Area are summarized below.

Management Area C-41 Part of Rodman Bay (LUD IV)

Management Emphasis: Timber stand improvement will continue on previously harvested areas. Wildlife habitat improvement opportunities for Sitka black-tailed deer will be emphasized in conjunction with timber stand improvement activities. Opportunities for fishery habitat enhancement, including bridge and culvert removal on old road systems and rearing habitat debris management, will be pursued during the 1985 to 1989 period. Beach log salvage operations may take place in all VCUs in both the 1985 to 1989 and 1990 to 2019 time periods. Scheduled activities include timber stand improvement, habitat improvement, timber sale preparation, reforestation, and soil stabilization. VCUs 291 and 292 (Rodman Bay) are not inside the Kelp Bay Project Area. VCU 293 (Appleton Cove) and VCU 294 (Saook Bay) are part of this MA and are in the Kelp Bay Project Area.

Management Area C-42 Lake Eva (LUD II)

Management Emphasis: Management for this area will continue to favor dispersed recreation and fishery enhancement. Management of the Lake Eva recreation cabin for use by disabled individuals will continue. The existing trail will not be extended around the lake to the recreation cabin. The trail will be reconstructed from the Adirondack shelter at the inlet during the 1985 to 1989 period. The Adirondack shelter will be maintained. Beach log salvage operations may take place in all VCUs in both time periods.

Recreation and fishery enhancement will continue to be favored for the Lake Eva Management Area.

VCU 295, Lake Eva, is a LUD II area. This VCU is surrounded by the rest of the Project Area. There are no timber harvesting, road construction, or log transfer facilities proposed for the Lake Eva VCU. However, the effect of the proposed activities elsewhere in the Project Area on resources in this VCU will be evaluated and considered.

Management Area C-43 Kelp Bay (LUD III and LUD IV)

Management Emphasis: Previously planned harvest for the APC 1976 to 1981 and 1981 to 1986 operating periods will be carried forward for future harvest. The Forest Service administrative cabins in VCU 315 will be placed on the recreation cabin system during the 1985 to 1989 period. Salvage harvest under a ranger sales program will be encouraged for beach logs. Timber stand improvement activities will continue on previously harvested areas. The Forest Service administrative cabin in VCU 296 will be studied for relocation to a new site for potential inclusion on the public recreation cabin system. Beach salvage operations may take place in all VCUs in both time periods, 1985 to 1989, and 1990 to 2019.

VCUs 296 (Portage Arm) and 297 (Catherine Island) are designated as LUD IIIs; VCUs 298 (Middle Arm), 314 (Glacial River), and 315 (Kelp Bay) are designated as LUD IVs, within the Kelp Bay MA.

Evaluation of timber harvesting and road building activities within the Kelp Bay Project Area are consistent with both the LUDs and the activities documented by the TLMP, as amended. All VCUs also fall within the APC timber sale contract boundary.

Finally, consistent with modifications to the APC long-term contract, the Chatham Area has subdivided the land within the contract boundary into smaller geographic areas, or "timber offering areas." Offering areas are geographic areas within the APC long-term contract boundary where, to meet requirements of the contract described in the A Division of the contract, the Forest Service specifies timber harvest units, roads, and other facilities and operations. One or more offering areas may be identified within all or a portion of an operating area previously identified under this contract. Operating areas may range from portions of individual VCUs up to several VCUs in size, depending largely on logical transportation systems and the amount of timber necessary to make available to meet contract requirements over time (Forest Service, 1989a).

These timber offerings will be based on volume needed to meet contractual obligations to have a minimum of 240 MMBF available on an annual basis starting in 1991. By 1996, this minimum volume will rise to 360 MMBF required to be available on an annual basis (Forest Service, 1991).

How the Kelp Bay Project Area was Selected

The *Background* section of this chapter explains how modifications to the APC long-term contract have resulted in smaller areas for environmental analysis. Enactment of the Tongass Timber Reform Act requires the Forest Service to follow a planning and environmental assessment process consistent with independent national forest timber sales (P. L. 101-626).

As part of the Forest Plan implementation process, and prior to selecting the Kelp Bay Project Area, all lands within the APC contract area were analyzed and divided into approximately 50 small geographical areas. Each of these small geographical areas represented a watershed or other area having commercial timber tributary to an existing or future log transfer facility. The 50 small geographical areas were then grouped into approximately 18 potential project areas for which timber harvest activities could be proposed and environmental analysis completed. The potential project areas were identified based on common geographic features,

Timber harvesting first occurred in the Kelp Bay Project Area in the 1960s. Second-growth on previously harvested units ranges from 15 to 30 feet tall.

past harvesting activity, pending legislative action, and estimated available volumes of timber. Appendix A provides the background and rationale for this process.

In September 1989, the Chatham Area Management Team met to evaluate the 18 potential project areas. The outcome of that meeting was to tentatively schedule for analysis 5 of the 18 areas over the next 5 years (1991-1996). The Kelp Bay Project Area was scheduled for EIS preparation first for the reasons listed below.

National Controversy Concerning Management of the Tongass National Forest

In September 1989, based on pending legislation in Congress, it appeared the public wanted certain areas within the APC contract boundary to be protected from timber harvest and road construction. At that time, timber harvest activities were not scheduled in any of the areas under consideration for such designation. The Kelp Bay Project Area was not included in legislative proposals considered by Congress for special designation, making it eligible for consideration. It was also not considered in the Tongass Timber Reform Act enacted November 1990, for designation as Wilderness or special LUD II.

Length of Time Since the Past Harvesting Occurred

Timber harvesting under the APC contract in the Kelp Bay Project Area first occurred between 1960 and 1964, with additional harvesting between 1971 and 1977. The time span since harvest ranges from 14 to 30 years. Second-growth on previously harvested units ranges from 15 to 30 feet tall. This regeneration adequately meets Regional standards for

created openings so mature timber may be harvested adjacent to young stands. Based on the time since the last harvest and the Project Area's current silvicultural condition, the Project Area can be scheduled for another harvest.

Consideration of Potential Effects on Subsistence Users

With the passage of the Alaska National Interest Lands Conservation Act, Congress recognized the importance of subsistence resources to the rural residents of Alaska. The act of gathering subsistence resources in Southeast Alaska communities is fundamental to the customary and cultural lifestyles of many people.

The proposed activities in Kelp Bay and along Peril Strait were anticipated to have lower conflicts with subsistence users in local communities. Sitka is roughly 75 water miles from this area. Angoon is much closer, about 12 water miles from the Project Area, but sits on Admiralty Island. When the Alaska National Interest Lands Conservation Act was enacted, Admiralty Island was designated as a National Monument and fully protected from land development activities. It was believed that the Angoon Tlingts could continue their customary and traditional lifestyles based on the abundant resources available on Admiralty Island, and that proposed actions in the Kelp Bay area would result in fewer conflicts with subsistence users than harvesting in areas closer to Sitka residents.

The Area Appears to Have Sufficient Volume to Meet APC Long-term Contract Commitments

The modified terms of the contract with APC (July 1, 1990) require the Forest Service to have a minimum of 240 MMBF of current timber supply available to APC annually between 1991 and 1996. After 1996, the minimum annual current timber supply rises to 360 MMBF. This amount, which represents between two and three years of normal timber stock, would be needed so APC could schedule the flow of raw materials to their mills.

The proposed activities for the Kelp Bay Project Area are expected to supply approximately 100 MMBF (Morrison, 1990). While one EIS is being prepared, this EIS would result in one or more timber offerings to APC. This should be enough volume to meet current timber supply needs for maintaining APC operations. The volume provided must last until the next scheduled project area can be analyzed and an EIS completed.

Based on a preliminary review of the entire contract area (Appendix A), the seven LUD III and LUD IV VCUs which are encompassed by the Kelp Bay Project Area appear to have sufficient volume available to warrant detailed investigation and analysis. This investigation and environmental assessment has resulted in preparation of this Draft EIS.

Issues

The Forest Service planning process requires early and extensive involvement of the public. From the first public scoping statement and publication of the Notice of Intent (issued March 1, 1990) to the publication of the Draft EIS, the Kelp Bay interdisciplinary team contacted approximately 420 individuals; 5 organizations; and 15 municipal, State, and Federal agencies. A second mailing describing the issues and consolidating public comments was sent to 425 people on June 26, 1990. Since the beginning of scoping, a total of five public discussions and meetings have been conducted. (A list of these contacts and meetings are included

in Appendix B.) The range of public responses to the issues must address concerns within the physical, biological, and legal limits of national forest management. Each issue statement is followed by the key indicators which will be used to evaluate how well each alternative, described in Chapter 2, meets the issue.

Issue 1: Social and Economic Effects of Timber Harvest Activities

This issue reflects concern about effects on community employment and income, population, community stability, and lifestyles (Forest Service, 1990a). The economies of most communities in Southeast Alaska depend almost exclusively on the Tongass National Forest to provide natural resources for uses such as fishing, tourism, recreation, timber harvesting, mining, and subsistence. Many Southeast Alaskans want to maintain the natural environment which makes their lifestyle unique. At the same time, they want to continue maintaining their economic livelihood. With limited resources, finding the balance becomes increasingly complex. Communities of primary focus are those closest to the Kelp Bay Project Area (Angoon), or those that would use timber to produce goods (Sitka and Wrangell). The key indicators for this issue will be employment and income, population, community stability, and maintenance of lifestyle as they relate to Southeast Alaskan communities.

Issue 2: Water Quality and Fish Habitat

This issue addresses public concern for protecting water quality in streams which provide habitat to anadromous and resident fish (Forest Service, 1990a). The aquatic resources of the Kelp Bay Project Area are extremely important to sport, commercial, and subsistence users in several Southeast Alaskan communities. The Kelp Bay area provides fish, shellfish, and marine mammals to a diverse group. Key indicators for evaluating water quality and fish habitat protection will be proximity of units and roads to riparian areas. The relative risks of erosion and sediment delivery potential will be addressed narratively.

The aquatic resources of the Kelp Bay Project Area are important to the commercial fishing industry.

Issue 3: Subsistence

This issue reflects public concern for the availability of wildlife, marine life, and plants for the "customary and traditional" use by "rural Alaskan" residents. Specifically, the Alaska National Interest Lands Conservation Act requires the Forest Service to determine if proposed activities may significantly restrict use (Forest Service, 1990a). Subsistence is a complex issue which extends beyond the boundaries of the Kelp Bay Project Area. The Tongass Resource Use Cooperative Survey (TRUCS) identifies 11 rural communities that obtain some of their subsistence resources from the Kelp Bay Project Area. Key indicators to be addressed include changes in the quantity and quality of habitat which support fish and/or wildlife. These changes will be related to wildlife model projections and harvest information available from the Alaska Department of Fish and Game (ADF&G) to evaluate what effect proposed activities may have on availability of game for subsistence users. Other aspects of subsistence that will be evaluated are competition from non-rural subsistence users and access to resources. The evaluation of competition relies on ADF&G hunter survey information. Residents of communities other than the 11 rural communities identified by TRUCS are considered non-rural. Access to resources will be evaluated on the basis of beach fringe affected by management activities and road management strategies for future use.

Subsistence hearings will be held during the review period for the Draft EIS. This will provide those people whose subsistence use may be affected an opportunity to inform the Forest Service how they think the alternatives would affect their ability to gather subsistence resources.

Salmon sides drying in the sun. The availability of such resources for traditional use by rural Alaska residents is an important issue.

Issue 4: Wildlife

This issue includes concern over several wildlife species and the habitats critical to maintenance of wildlife populations (Forest Service, 1990a). Alaska's fish and wildlife are valuable for aesthetic, economic, recreational, and subsistence purposes. More than 300 species of birds, fish, and mammals inhabit in the Tongass National Forest. Key indicators for this discussion will be the acres of habitat and habitat capability currently available compared to acres available following proposed activities (for each of the key wildlife indicator species). The key wildlife indicator species are described in detail in Chapter 3. Biological diversity will also be discussed.

The Alaskan brown bear. This Draft EIS addresses habitats critical to maintaining wildlife populations.

Issue 5: Scenic Quality

This issue addresses concerns about areas viewed from popular recreation use areas and marine travel routes. The Kelp Bay Project Area includes many recreation use areas and adjoins both the Alaska Marine Highway and small boat travelways (Forest Service, 1990a). Scenic quality is one factor which contributes to local use of the Kelp Bay Project Area. The aesthetic backdrop provides the basis for recreation, tourism, and related lifestyles. Key indicators for discussion will be changes occurring between the inventories Visual Quality Objectives (VQOs) and VQOs resulting form proposed harvesting/road building activities. Discussion will center on changes in the VQOs and the visual condition resulting from proposed activities.

Issue 6: Recreation

Remoteness and solitude are two of the characteristics which make the Kelp Bay Project Area attractive to visitors. This issue addresses concerns about how increased development would change the primitive and semi-primitive character of this area (Forest Service, 1990a). Key indicators for evaluating changes to the recreational experience will be based on changes in acres of Recreation Opportunity Spectrum (ROS) classes. Changes in Recreation Places and accessible shoreline areas due to timber harvest and road construction activities will also be discussed.

Lake Eva was designed by the TLMP as a LUD II. No timber harvest or road building activities are proposed for the Lake Eva VCU.

Issue 7: Marine Environment

This issue addresses public concern with the location of log transfer facilities, logging camps, and associated log sort yards, and their potential effects on the marine environment (Forest Service, 1990a). The shallow marine waters and their associated mud flats and estuaries found in protected coves and bays within the Project Area provide vital habitat for some important species such as Dungeness crab and juvenile salmon. Since coves and bays are the points of concentrated activity associated with marine transport of logs, logging camps , and sort yards, some marine species are subject to effects from log transfer and storage facilities. Key indicators for this issue will be acres of impact, whether the habitat is marine or estua-

Tugboat towing harvested timber while a passenger ferry passes in the background. The Forest Service seeks to balance the economic and recreational demands regarding the Tongass National Forest.

rine, species diversity present at each site, and location and type of facilities being considered for construction. Twelve log transfer facility sites are under consideration in the alternatives.

Issue 8: Timber

The timber issue addresses public concern for the amount of timber proposed for harvest, concerns about the condition of previously harvested stands, and concern for economical entry into new stands (Forest Service, 1990a). This issue centers on the number of acres being proposed for harvest in relation to the number of acres of forested land. There is also a perception that more acres of high volume stands are being harvested than is reasonable to sustain long-term timber production. Questions have been raised about the condition of stands harvested in the 1960s and 1970s. Related to the proposed alternatives is the question of economical harvest of timber and road construction.

The first key indicator for discussion of the timber issue will be acres of suitable forest proposed for harvest, listed by plant associations and volume class. Additional indicators will include descriptions of stands previously harvested. Compliance with Tongass Timber Reform Act in terms of proportional harvest for Volume Classes 6 and 7 will be displayed. The final indicator will be presentation of timber appraisal data based on a 10-year average selling value, current logging costs, and estimated road construction costs. This method of using timber appraisal data to evaluate the economics of the alternatives is consistent with the process used for national independent timber sales.

Other Issues Raised

The following two concerns were highlighted during scoping. The first deals with effects of proposed (now enacted) congressional legislation. The second regards a commitment of trust. Though these issues are of public interest, neither would have served as guiding development for a range of alternatives.

Issue A

Concern that proposed legislation would affect the current plans for Kelp Bay (Forest Service, 1990a).

Response A

The Tongass Timber Reform Act, enacted November 28, 1990, will be addressed for all alternatives in the Kelp Bay timber sale project (planning, stream buffers, purchaser credits, timber stumpage values, etc.) consistent with an independent national timber sale).

Issue B

Concern that monitoring plans be developed during the course of the project, and not be something the Forest Service promises to do after the EIS (Forest Service, 1990a).

Response B

A monitoring plan will be included with the Final EIS and Record of Decision.

Issues Which Will Not be Addressed

The following issues will not be addressed in this EIS because their resolution is beyond the scope of this document.

Issue C

Concern that the Forest Service mission statement implies we must make timber available to the Orient ("The Forest Service mission is to provide a continuing flow of natural resource goods and services to help meet the needs of the Nation and to contribute to the needs of the international community"). Strongest objection was to the phrase "international community" (Forest Service, 1990a).

Response C

The Forest Service mission statement applies to the whole Agency and is outside the scope of a project-level plan. For instance, the phrase "and to contribute to the needs of the international community" can be interpreted in many ways, such as research for acid rain, joint

studies between Canada and the United States on wood product utilization, and other cooperative research studies. Under no circumstances should people interpret the mission statement which applies to the Nation as a mandate to make wood from a single national forest available to the Orient.

Issue D

Lack of agreement with selection of Kelp Bay over other areas. Public involvement in a life-of-sale type of plan was suggested so the public could help schedule individual project locations within the APC contract area (Forest Service, 1990a).

Response D

Many of the landscape scale decisions were made in the Tongass Forest Plan through land use designations. Other decisions were made by the U.S. Congress. Examples would be enactment of the APC Long-Term Timber Sale Contract in 1956, and the Tongass Timber Reform Act in 1990. The former specified portions of Chichagof, Baranof, and Kuiu islands as the APC contract area and the latter set aside additional special LUD II areas for future generations. With regard to the land inside the APC contract boundary designated for timber harvest to meet Forest Service contractual obligations, the Forest Service maintains the discretion on when and where to schedule current and future projects.

The TLMP is currently being revised. The revision process, though well underway, is the appropriate forum for interested public to affect land use prescriptions and management strategies. Part of the revision process includes preparing a tentative 10-year timber harvest schedule. Interested persons are encouraged to make timely input to the Forest Plan revision process concerning future timber harvest schedules.

In addition, the Kelp Bay EIS includes a detailed analysis of the No-action Alternative. This alternative provides the Regional Forester with an option to choose another area within the APC contract boundary from which to make the required volume available.

Permits and Licenses

To proceed with the timber harvest as addressed in this EIS, various permits must be obtained from other agencies. Administrative actions on these permits would take place 30 days after the Final EIS is filed with the Environmental Protection Agency (EPA). The agencies and their responsibilities are listed below.

U.S. Army Corps of Engineers (ACOE)

- Approval of discharge of dredged or fill materials into the waters of the United States (Section 404 of the Clean Water Act)
- Approval of construction of structures or work in navigable waters of the United States (Section 10 of the Rivers and Harbors Act of 1899)

U.S. Environmental Protection Agency

- National Pollutant Discharge Elimination System (NPDES) review (Section 402 of the Clean Water Act)

State of Alaska, Department of Natural Resources

- Authorization for occupancy and use of tidelands and submerged lands

State of Alaska, Department of Environmental Conservation

- Solid Waste Disposal Permit (Section 402 of Clean Water Act)

U.S. Coast Guard

- Coast Guard Bridge Permit (in accordance with the General Bridge Act of 1946) required for all structures constructed within the tidal influence zone

Legislation Related to This EIS

Shown below is a brief list of laws pertaining to preparation of EISs on Federal lands. Some of these laws are specific to Alaska, while others pertain to all Federal lands.

- National Historic Preservation Act of 1966
- National Environmental Policy Act (NEPA) of 1969 (as amended)
- Clean Air Act of 1970 (as amended)
- Alaska Native Claims Settlement Act of 1971
- Marine Mammal Protection Act of 1972
- Endangered Species Act of 1973
- Forest and Rangeland Renewable Resources Planning Act of 1974
- National Forest Management Act of 1976 (as amended)
- Clean Water Act of 1977
- Alaska National Interest Lands Conservation Act of 1980
- Tongass Timber Reform Act of 1990.

In addition, the Coastal Zone Management Act of 1976 (CZMA) pertains to the preparation of the EIS. This act, passed by Congress in 1976 and amended in 1990, requires Federal agencies conducting activities or undertaking development affecting the coastal zone to ensure that proposed developments are consistent with approved State coastal management programs to the maximum extent practicable. The State of Alaska passed the Alaska Coastal Zone Management Act in 1977 to establish a program that meets the requirements of the Coastal Zone Management Act. It contains the standards and criteria for determining the consistency of activities within the coastal zone.

The Forest Service will evaluate the preferred alternative prior to completion of the Final EIS and the ROD to ensure that the activities and developments being proposed are consistent with approved coastal management programs to the maximum extent practicable.

Chapter 2

Alternatives Including the Proposed Action

Chapter 2

Alternatives Including the Proposed Action

Introduction

Chapter 2 is the heart of this Environmental Impact Statement. This chapter summarizes the development of alternatives for making timber available to the APC while implementing the Tongass Land Management Plan (TLMP) in the Kelp Bay Project Area; it also discusses alternatives considered but eliminated from detailed study. Finally, this chapter discusses, compares, and evaluates the five alternatives selected for detailed study. An "alternative" is a mix of activities designed around a particular emphasis or theme. Chapter 2 provides the decision-maker with a clear basis for choice.

Much of the important information in Chapter 2 (e.g., the comparison of alternatives) is summarized from Chapters 3 and 4. These later chapters contain the detailed scientific basis for establishing a baseline and measuring the environmental consequences for each of the alternatives. For the best understanding of the five alternatives, readers should consult Chapters 3 and 4 for details.

Chapter 2 begins with a description of how the alternatives were developed. This is followed by an account of how the Interdisciplinary Planning Team studied the implications of proposed alternatives and eliminated some from further consideration. A detailed description of the five alternatives follows. The chapter concludes with a comparison and evaluation of the five alternatives.

The Planning Team has made an effort to present the alternatives in an understandable format.

Alternative Development

Each alternative presented in this Draft EIS is a different response to the issues of concern discussed in Chapter 1. For this Draft EIS, five alternatives were designed to explore ways to satisfy public concerns and resolve issues of concern. Each alternative represents a site-specific proposal. From this range, the Regional Forester has a basis for judging which alternative provides the most public benefit.

2 Alternatives Including the Proposed Action

New Perspectives

At the heart of the development of the alternatives is a concept that has been given considerable attention in forest management--"New Perspectives." New Perspectives is an attempt to use new silvicultural strategies, and re-evaluate older ones, to bring about a different balance in resource production in managed landscapes. The basic philosophy of New Perspectives is mimicking natural ecological processes, and maintaining options for future management while we learn more about the impacts of our management on the ecosystem.

New Perspectives looks at forest management on two levels: (1) the landscape level, which may be a VCU, watershed, or viewshed; and (2) the stand level, which deals with individual harvest units. Some tools employed at the landscape level may include maintaining large tracts of undisturbed old-growth by concentrating timber harvest in certain areas, minimizing the "edge-effect" by designing larger harvest units, and using beach fringe and stream buffers for corridors between old-growth blocks. Some tools employed at the stand level may include reducing harsh edges by unit placement and feathering edges of cutting units, looking for opportunities to retain small patches of uncut timber in harvest units (where feasible and practical), leaving snags in harvest units (where safety regulations allow), and using group selection cuts. All of these concepts were considered and used in final individual harvest unit and road design and selection of harvest units for the alternatives. Which tools will be used in which harvest unit will be determined at the time the detailed silvicultural prescription is written for each harvest unit.

The Development Process

Listed below are several general stages used to develop the range of alternatives along with the chronological point in the process at which each stage occurred. Throughout the process, the Planning Team used a systematic, interdisciplinary approach in building alternatives.

In project planning, it is necessary to identify the laws and regulations, national and regional direction, and standards and guidelines which apply to the proposed actions. During March 1990, the Interdisciplinary Team compiled into a single document the project standards and guidelines, called "Design Criteria," which would serve as sideboards for how timber harvest and road construction would occur in the Kelp Bay Project Area. These guidelines are included in Appendix C.

Scoping for the Kelp Bay Project began in March 1990, and concluded in the middle of April of the same year. The results of scoping were used to finalize the eight issues described in detail in Chapter 1. In early August, the Interdisciplinary Team met to review each issue and a summary of the public comments about each issue, and to discuss options for resolving the issues. During this meeting, the Team discussed a range of solutions to each of the eight issues. At the conclusion of the meeting, it was apparent that some of the solutions for one issue overlapped with solutions for one or more of the other issues. These areas of overlap were highlighted and became the focus for developing themes or strategies around which to design the proposed harvest activities.

The Interdisciplinary Team consolidated the potential to resolve the issues into five major themes with specific features identified to address portions of each issue in a variety of ways. These became the themes introducing each alternative in the section of this chapter titled *Alternatives Considered.*

Concurrently with the development of a range of alternative themes, the Interdisciplinary Team and the field crew combined efforts to design a series of individual timber harvest units and a transportation system to access these units. The field verification phase lasted from mid-May through mid-October 1990. The unit and road design stage lasted from August

through October 1990. The intent of this process was to develop timber harvest units and road accesses which met the design criteria, and which would be feasible for inclusion into one or more of the alternatives. This effort resulted in a “pool” of units and road segments which could be assigned to any of the alternatives. This unit pool consisted of a roughly 280 timber harvest units equaling 12,067 acres and approximately 329 MMBF of timber. The road pool consisted of roughly 170 miles of road and 12 log transfer facilities (LTFs) for consideration in the alternative selection process.

Float plane leaving a Forest Service field camp where the crew conducted field investigations.

It should be remembered that timber volumes presented for each of the action alternatives are estimates based upon information available at this time. As with any timber sale, an intensive timber cruise will be conducted on the acreage made available to APC to determine actual timber volume. In addition, the process used to estimate timber volumes will be reviewed between the Draft and Final EISs. This will ensure compliance with provisions of the Tongass Timber Reform Act dealing with accountability of utility volume. This review could result in minor changes to estimated timber volumes but would not cause any change in predictions of consequences that will be displayed in Chapter 4.

During the final week of October 1990, the Interdisciplinary Team met and began assigning harvest units and roads to the alternatives based on the alternative themes and features. Through this process, some unit and road segments were not selected for any alternatives due to characteristics which did not meet the intent of the alternative.

During the second week of November 1990, the Team met to complete the alternative descriptions. These final steps were needed to identify mitigation measures, enhancement projects, and monitoring requirements specific to each alternative.

Just before Thanksgiving, the Interdisciplinary Team met with the Chatham Area Management Team and the Sitka District Ranger to present the themes, features, mitigation, enhancement and monitoring for each of the alternatives. The Chatham Area Management Team determined that the range of alternatives was sufficient to address the eight issues.

In the final week of November 1990, President Bush signed the Tongass Timber Reform Act (P.L. 101-626). This required the Team to re-assess each of the alternatives in light of proportional harvest for Volume Classes 6 and 7, and to ensure that 100-foot buffer strips were left along all anadromous fish streams and resident trout fish streams which flow into anadromous fish streams. This re-assessment resulted in minor changes to the alternatives.

During the second week of December 1990, the Interdisciplinary Team met to discuss the effects analyses of the alternatives. It became clear that the strategy for road management following the end of the timber harvest activities would be a major effect on resources such as subsistence, wildlife, and recreation.

Forest roads are classified in relation to their service life as either short-term (10 years or less design life) or long-term (10 years and greater). Short-term and temporary roads are developed and operated for a limited time and cease to exist as a transportation facility after the purpose for which they were constructed is completed. When the need for access provided by these roads has ended, the drainage structures are removed, and the roadbed is waterbarred and seeded as necessary, as required by the timber sale contract. These roads would not be included in the forest Transportation Inventory System (TIS).

Long-term or forest development roads are developed and operated to provide either continuous or periodic access for long-term land management and resource utilization needs. They are constructed either under the terms of timber sale contracts or by means of formal road construction contracts. Between periods of commercial timber haul, these roads will be maintained as prescribed by their Road Management Objectives (RMOs), for future resource access needs. Maintenance strategies may range from the roadway being continually graded and kept open for incidental traffic to intermittent periods of closure during which the encroachment of natural vegetation is allowed. In all cases, the drainage structures will be maintained to protect natural resources. During periods of closure, those repairs needed to protect the investment and preserve structural integrity will be performed. Along the roadway, maintenance will be performed only as needed to facilitate restoration of the roadway for future use and to alleviate erosion or sedimentation. This will include the application of grass seed to the roadbed.

Strategies for management of these roads had to be clearly defined before accurate effects analysis could occur. Consequently, strategies for road management were developed by the Interdisciplinary Team. These strategies were developed to be consistent with the themes of the alternatives, and were then reviewed by the Sitka District Ranger and the Alaska Department of Fish and Game.

Alternatives Eliminated from Detailed Study

Alternative A

One of the public comments from the scoping process was a request that the Interdisciplinary Team consider interconnecting a road system from Saook Bay (VCU 294) across Lake Eva (VCU 295) into Hanus Bay (VCUs 296 and 297). The reason for this suggestion was that the ongoing TLMP Revision was developing more specific prescriptions than Land Use Designations (LUDs) I through IV utilized in the current TLMP. It was also suggested that such a connection would be more cost-efficient for the future timber operator.

The 1986 amendment to the TLMP defines the parameters under which roading may occur within a LUD II area. These include serving mining, power, and water developments; aquaculture developments; transportation needs determined by the State of Alaska; or vital forest transportation system linkages. None of these circumstances pertains to the concept of building a road across VCU 295 to support timber harvest. Forest transportation systems within adjoining LUD III and LUD IV areas are sufficient to serve timber harvest needs without a road through VCU 295. Such a road would not constitute a vital forest system linkage. VCU 295 (Lake Eva) is designated a LUD II, (to be managed for its roadless character) which was supported by the majority of responses to scoping.

Recreational cabin at Lake Eva. One of the alternatives eliminated from detailed study involved building a road through the Lake Eva VCU.

Alternative B

According to the existing TLMP, all of VCU 314 is scheduled for timber harvest and commodity development. This would indicate harvesting both Glacial River and Clear River in the South Arm of Kelp Bay (VCU 314) to a single LTF. Since the Draft TLMP Revision identified Glacial River as a Wild and Scenic River candidate, the Interdisciplinary Team recommended the Glacial River drainage be dropped from further consideration at this time. The Chatham Area Management Team approved the recommendation. This decision allows the Forest Plan revision process to continue without precluding such a designation in the future, if warranted.

Alternative C

As the Planning Team examined a series of solutions to the eight issues, one theme kept recurring. This theme involved the concept of minimizing short-term and cumulative effects by scheduling harvest in areas not previously harvested. During the final week of October 1990, as the Interdisciplinary Team began assigning units and roads to the range of alterna-

tives, it became apparent that there was insufficient area and volume to not revisit some areas previously harvested. To not have enough volume to meet the minimum contract requirements would be outside the scope of this analysis; thus, strictly limiting the harvest to those areas never before harvested was dismissed. The features from this alternative, however, were combined with Alternatives 2 and 4.

Educating logging camp personnel about brown bear behavior, including proper garbage disposal, will be important to promote low impact coexistence of brown bears and humans.

Mitigation Measures Common to All Action Alternatives

The Forest Service uses numerous mitigation and preventative measures in everyday practice. The application of these measures begins during the planning phases of a project; links to the overall Forest, Chatham Area, and Ranger District management direction; and continues through all phases of subsequent forest management. The first objective is to foresee and avoid potential problems in the planning stage. Many of these preventative measures are described in detail in Appendix C, Design Criteria, and were applied during the design phase of alternative development.

Most mitigation measures used to reduce or eliminate adverse effects are identified at the time the Record of Decision (ROD) is signed. Listed below is a brief summary of some mitigation measures (in addition to those listed in Appendix C) available for consideration. Public comment on the Draft EIS will be helpful in identifying when and where mitigation measures should be considered for use.

Water Quality and Fish Production

Mitigation which protects water quality and fish habitat includes application of the Best Management Practices (BMPs) stated in the Aquatic Habitat Management Unit Handbook (Forest Service [A]) and in the Soil and Water Conservation Handbook (Forest Service [D]). These handbooks combine to provide standard operating procedures for all stream classes. In addition, the Tongass Timber Reform Act mandates a minimum 100-foot buffer on all Class I streams, and on Class II streams that flow into Class I streams. Application of BMPs from these two handbooks, and adherence to the law, will protect water quality and fish habitat, as well as riparian habitat important to other species such as deer, bear, and furbearers.

Wildlife

Mitigation measures built into the design of the alternatives to protect wildlife habitat include the location of the harvest units. Harvest units are intentionally located away from important wildlife habitats (to the extent practicable) to reduce effects on wildlife. Beach and estuary fringe habitats are avoided as much as possible. Travel corridors were left untouched (where practicable) to allow movement of wildlife between areas.

Other measures considered to mitigate impacts include road closures, hunting restrictions during active logging operations, retention of snags where safe to do so, prescribing second-growth management such as precommercial thinning, and scheduling harvest activities to reduce disturbance to bald eagle nesting and rearing activity.

Impacts on brown bear can be partially mitigated by restricting activities near salmon spawning streams during salmon runs to minimize potential conflicts with humans. Imposing hunting restrictions during active logging operations, and closing roads and camps after logging also help. Designating and managing in cooperation with ADF&G a brown bear

viewing area in Saook Creek or Clear River is another option which would mitigate some of the impacts to brown bear through closing hunting seasons and reducing human pressure. Impacts on brown bear can also be mitigated by informing logging camp residents about brown bear behavior and bear management policies, as well as by effectively resolving bear/garbage problems.

Subsistence

Because most subsistence use involves the harvesting of fish and game, mitigation measures that protect or enhance fish and game resources will also protect and enhance subsistence activities. Mitigation measures were built into each of the alternatives considered in this Draft EIS by placing units and roads away from beach and estuary fringe habitats and away from salmon bearing streams. Other specific measures incorporated during unit and road location and design are detailed in Appendix C.

One concern is the amount of time logging camps would remain active in the Project Area. Two methods of approach are viewed as mitigating this effect. The first would be "get in and get out," where the impact of having active logging camp operations in the Project Area are mitigated by issuing "offering areas" simultaneously. This technique is thought to limit the duration of conflicts between subsistence and non-subsistence resource gatherers.

A second approach would be to have just one or two active camps in the area at one time, and have those camps move from one LTF to another as harvesting operations are completed. This means fewer people working and living in the area but present for a longer span of time. Either of the above options are possible through the scheduling of individual "timber offering areas" based on the Tongass Timber Reform Act contract modifications with APC.

Recreation

Effects from timber harvest on views from anchorages and known recreational day use areas can be reduced by leaving buffers of timber along beaches and inland lakes (to the extent practicable) to reduce direct effects on recreation opportunities.

Monitoring

A fully developed, site-specific monitoring plan will be developed with the Final EIS and ROD. The following monitoring activities are common to each action alternative:

- Assuming that BMPs are not 100 percent effective, followup monitoring will determine successful implementation and effectiveness of BMPs and buffers in meeting water quality and fish habitat protection objectives.
- Active LTFs will be monitored as required by permit.
- Harvested stands for silviculture treatments like site preparation, regeneration, planting, and precommercial thinning will be monitored in all alternatives.

The Portage Arm Watershed study could be monitored for sedimentation and cumulative watershed effects (only in Alternatives 2 and 4).

Alternatives Considered

Five alternatives for making timber available to the APC in the Kelp Bay Project Area under the requirements of the TLMP were considered in detail. The descriptions of the alternatives are summarized below. For each alternative there is a discussion of (1) the theme or intent of the alternative, (2) guidelines used in selecting units and roads consistent with the themes, (3) a table summarizing the volume of timber harvest by VCU and the acres to be harvested by logging method, (4) a table showing long-term, short-term, and total road miles by VCU, (5) identification of individual harvest units or combinations which may exceed 100 acres, and (6) enhancement opportunities specific to each alternative.

The identification of harvest units which exceed 100 acres is displayed for each alternative because current regional direction in the Alaska Regional Guide (Forest Service, 1983) states that:

> "100 acres is the maximum size of created openings to be allowed for the Hemlock-Sitka spruce forest type of coastal Alaska, unless excepted under specific conditions. Recognizing that harvest units must be designed to accomplish management goals, created openings may be larger where larger units will produce a more desirable contribution of benefits."

The specific conditions listed in the Alaska Regional Guide include considerations for topography, condition of adjacent openings, effects on water quality or quantity, effects on wildlife and fish habitat, regeneration requirements, transportation, economic considerations, and harvest system requirements (if pockets of isolated timber would be created which could not be harvested in the future). Also addressed are the natural and biological hazards such as windthrow, insect or disease problems, and visual absorption capacity. Any unit or combinations of units more than 100 acres in size for this Draft EIS require approval of the Regional Forester. This approval would be given at the time the ROD is signed and released.

Many of the enhancement opportunities identified for each alternative may be possible through funding under the Knutson-Vanderburg (KV) Act of 1930. The Knutson-Vanderburg Act, as amended by the National Forest Management Act of 1976, allows the Forest Service to collect receipts from timber sales for Sale Area Improvement (SAI) projects. Top priority for these funds is to ensure stand regeneration. Subsequent projects, such as precommercial thinning, fisheries enhancement, and soil stabilization are prioritized and listed on the SAI plan. If funding is not available from KV receipts for resource enhancement projects, then these projects could be added to the regular program budget. The SAI plan will be developed after the Final EIS and ROD are signed.

Alternative 1

The theme of this alternative is to propose no timber harvest or road construction in the Kelp Bay Project Area for fiscal year 1992. It is also assumed that additional timber volume would not be available from somewhere else within the APC long-term timber sale contract area for fiscal year 1992. A "No-action" Alternative is required in an Environmental Impact Statement under the National Environmental Policy Act of 1969. This alternative serves as the benchmark by which effects of all action alternatives are measured. Selection of this alternative would not allow the Forest Service to meet minimum contract volume requirements.

Alternative 2

The theme of this alternative is distributing new harvest as widely as possible throughout the Kelp Bay Project Area. This approach emphasizes resolution of resource conflicts between development activities and non-timber resources by providing spatial distance between units to minimize adverse impacts. This alternative would consist of harvesting next to areas previously harvested, *and* moving into previously unroaded areas. Implementation of this alternative would schedule harvest of 5,094 acres in 130 harvest units for approximately 136.2 MMBF of timber, indicating an average unit size of 39 acres. To implement this level of harvest, 90 miles of new road would be constructed and 30 miles reconstructed along with seven LTFs. This indicates an average of 1.1 MMBF/mile of road. Table H-1 (Appendix H) shows the units specific to this alternative. Tables H-5 and H-6 show the long-term and short-term roads for all of the alternatives. Map 2-1 provides the spatial relationship between roads, units, and other geographic features of the Kelp Bay Project Area.

Guidelines used in selecting units and roads which would be consistent with the theme of dispersing activities include the following:

- Disperse activities over a wide area to reduce the concentration of development activities in subsistence use areas, to protect areas under special use permits to outfitter and guides, and to maintain a diversity of wildlife habitats within a watershed (Issues 1, 3, 6).

- Meet Visual Quality inventory objectives along tour ship and small cruise boat travel routes to maintain recreation and tourism related opportunities. This would be accomplished through placement and shaping of units, or partially harvesting some units in highly sensitive areas. (Visual Management Class 1 areas) (Issues 5, 6).

- Emphasize long-term timber production and road access through developing access to more watersheds in the Project Area (Issue 3).

The following two tables summarize the major activities associated with this proposal, timber harvest and road management strategies for each VCU. Table 2-1 shows the proposed logging system methods and acres of harvest for each method. More information about the effects of each harvest system can be reviewed in the *Timber* section of Chapter 4.

Table 2-2 summarizes miles of road by road management strategies. Table H-1 (Appendix H) shows the units specific to this alternative. Tables H-5 and H-6 show the long-term and short-term roads by individual road segments for all of the alternatives.

Table 2-1
Summary of Proposed Timber Harvest by VCU and Logging Methods for Alternative 2

VCU	Estimated Volume (MBF)	Logging Method (by Acres) Highlead	Live Skyline	Helicopter	Slackline	Total Acres
293	16,299	289	271	0	158	718
294	26,602	226	401	240	79	946
296	34,812	192	253	392	343	1,180
297	20,066	495	213	0	141	849
298	21,518	175	24	606	0	805
314	2,029	0	0	73	0	73
315	14,883	131	142	166	84	523
Total	136,209	1,508	1,304	1,477	805	5,094
Percent of Total		30	25	29	16	

SOURCE: Zaborske, 1991b.

Table 2-2
Summary of Long-term, Short-term, and Temporary Roads by VCU for Alternative 2 (in miles)

VCU	Logging Method (by Acres) Long-term	Short-term	Temporary	Total
293	13.75	5.95	24.05	
294	12.47	3.96	2.17	18.60
296	17.56	3.49	1.04	22.09
297	25.71	3.98	5.59	35.28
298	5.25	2.65	0.86	8.76
314	0	0	0	0
315	8.83	0.98	1.29	11.1
Total	83.57	19.41	16.9	119.88
Percent of Total	70	16	14	

SOURCE: Costa, 1991.

Propoposed Harvest Units or Combination of Harvest Units Over 100 Acres for Alternative 2

Unit Number(s)	Total Acres	Factors Considered
213	122	Logging system requirements (isolated timber) and economics. Blocks of isolated timber would be created which would be uneconomical to harvest in the future if left out of this unit now.
244	115	Logging system requirements and economics. Blocks of isolated timber would be created which would be uneconomical to harvest in the future if left out of this unit now.
302	152	Logging system requirements (isolated timber) and economics. Blocks of isolated timber would be created which would be uneconomical to harvest in the future if left out of this unit now.
506	111	Visual resource considerations. Blend unit with adjacent brush field to mitigate visual impacts. Logging system requirements and economics. Blocks of isolated timber would be created which would be uneconomical to harvest in the future if left out of this unit now.
522	122	Logging system requirements and economics. Blocks of isolated timber would be created which would be uneconomical to harvest in the future if left out of this unit now.
227, 228	115	These units were enlarged to tie into the muskegs on the north and the stream channel to the south. If the timber were left, it would likely blow down.
231, 232, 234	111	Logging system requirements and economics (units at end of road system, costly to rebuild road to harvest portion of volume in the future).
327, 354	114	Logging system requirements and economics. Blocks of isolated timber would be created which would be uneconomical to harvest in the future if left out of this unit now.
330, 353	116	Logging system requirements and economics. Blocks of isolated timber would be created which would be uneconomical to harvest in the future if left out of this unit now. Visual resource considerations include extending the unit vertically up the slope to reduce harsh horizontal line at midslope.
351, 503	101	These units are in a proposed watershed study area. Unit boundary was adjusted to facilitate study design per the request of the hydrologist.

Enhancement Opportunities Identified with Alternative 2

The following enhancement opportunities are identified with Alternative 2:

- A fish ladder could be constructed along Bourbon Creek near unit 518. This enhancement would provide 3 miles of additional stream habitat for pink salmon.

- Long-term roads will probably be utilized by Off-Road Vehicle (ORV) traffic, until the alder growth takes over. Some of these roads will be maintained in an open status, but not to low clearance vehicles. In addition, the long-term roads on Catherine Island could be maintained for recreational use, with the alder removed, if there is sufficient public demand. These travel routes could be developed to offset the unplanned use of ORVs currently occurring in the False Island area. The roads into Twin Lakes (7530) would be closed to all traffic to protect fish resources.

- Fish habitat enhancement through activities such as soil stabilization, stream rehabilitation, stream bank stabilization, and salmon rearing improvements could be scheduled using KV or program funding in the following sub-watersheds for this alternative. These activities would increase either the quantity of habitat or quality of in-stream habitat for anadromous species.

Sub-watershed Number	Reference Location	Units Within the Sub-watershed Area
P81A	Appleton	109, 126
Q11C	Saook	228
Q31A	Hanus Bay	307
Q37A	Portage Arm	331
Q64A	Middle Arm	522, 525, 526
T82A	South Arm	728

- Second growth management activities would be scheduled in regenerated stands for potentially improving deer winter range characteristics. These activities could be accomplished through either KV or program funding.

Sub-watershed Number	Reference Location	Units Within the Sub-watershed Area
P81A	Appleton	103, 126, 134, 158
Q11C	Saook	227
Q33A	Hanus Bay	323, 328, 330, 353
Q16A	Hanus Bay	360
Q42A	N. Catherine Is.	449
Q45A	Trader Islands	427
Q63A	Middle Arm	511
Q64A	Bourbon Creek	518, 521, 527
T73A	South Arm	637, 639, 724, 726, 729
T81A	The Basin	710, 711, 714

- Precommercial thinning to improve timber production is projected for the areas listed below. These areas would be investigated for desirability for thinning between 10 and 12 years after harvest.

VCU	Units
293	143, 144
294	213, 244
296	323, 328, 331, 332, 341, 350
297	419, 425, 449
298	520, 524, 525, 526
315	707, 710

- Hand planting to maintain current species composition or to meet National Forest Management Act (NFMA) requirements for adequate stocking is estimated in the following areas:

VCU	Units
293	109, 125, 126, 127, 129, 134, 138, 139, 140, 158
294	201, 206, 228, 231, 232, 234, 237, 242
297	402, 408, 426, 437, 439, 440, 442, 445
298	509, 511, 523, 534, 535
314	637
315	703, 707, 710, 728, 729, 730

- A recreation portage between Hanus Bay and Portage Arm in VCUs 296 and 297 could be constructed.

- A recreation cabin in The Basin of Kelp Bay would be constructed.

- A trail to the small lake above the falls in the Middle Arm of Kelp Bay could be built for day hiking and freshwater fishing.

- A recreation cabin could be constructed in Hanus Bay or Portage Arm.

- A trail could be constructed up Cosmos Creek for sport fishing, day hiking.

Alternative 3

The theme of this alternative is to focus development activities in the VCUs adjacent to Peril Strait (except for Lake Eva VCU), while maintaining Kelp Bay in its current condition. This approach emphasizes maintaining the primitive and semi-primitive character of Cosmos Cove, The Basin, South Arm, Middle Arm, and the southern two-thirds of Catherine Island and Portage Arm. This alternative would focus development activities in fewer VCUs, indicating the need for more intensive management in the VCUs scheduled for harvest.

Implementation of this alternative would schedule harvest of 4,537 acres, in 109 harvest units for approximately 121.1 MMBF of sawlog and utility volume, indicating an average unit size of 42 acres. To implement this level of harvest, 72 miles of new road would be constructed

and 23 miles would be reconstructed, along with three (3) LTFs. This indicates an average of 1.3 MMBF/mile of road. Table H-2 (Appendix H) shows the units specific to this alternative. Tables H-5 and H-6 show the long-term and short-term roads for all of the alternatives. Map 2-2 provides the spatial relationship between roads, units, and other geographic features of the Kelp Bay Project Area.

Guidelines used in selecting units and roads which would be consistent with the theme of intensive management being focused along Peril Strait include the following:

- Special Use Permit opportunities would be maintained for recreation and tourism-related employment in the Middle Arm, South Arm, and The Basin of Kelp Bay and Cosmos Cove (Issues 1 and 6).

- Individual harvest units would be clustered into fewer watersheds along Peril Straits, leaving the watersheds in Kelp Bay VCUs unchanged for wildlife habitats, water quality, and commercial fishing opportunities (Issues 2, 3, and 4).

- Recreational opportunities along Peril Strait would be managed to emphasize roaded-modified opportunities, while the remaining VCUs would be managed to emphasize primitive or semi-primitive opportunities (Issues 5 and 6).

Alternative 3 emphasizes development activities along Peril Strait. This photo shows log raft storage adjacent to Dead Tree Island in Hanus Bay.

The three LTFs proposed with this alternative would be constructed at formerly used locations and would meet the public concern for re-using former sites (Issue 7).

Table H-2 (Appendix H) shows the units specific to this alternative. Tables H-5 and H-6 show the long-term and short-term roads for all of the alternatives.

The following two tables summarize the major associated activities with this proposal, timber harvest and road management strategies for each VCU. Table 2-3 shows the proposed logging system methods and acres of harvest for each method. More information about the effects of each harvest system can be reviewed in the *Timber* section of Chapter 4.

Table 2-4 summarizes miles of road by road management strategies. Table H-2 (Appendix H) shows the units specific to this alternative. Tables H-5 and H-6 show the long-term and short-term roads, by individual road segments for all of the alternatives.

Table 2-3

Summary of Proposed Timber Harvest by VCU and Logging Methods for Alternative 3

		Logging Method (by Acres)				
VCU	Estimated Volume (MBF)	Highlead	Live Skyline	Helicopter	Slackline	Total
293	31,341	514	655	0	125	1,294
294	51,104	359	678	615	216	1,852
296	12,422	0	336	0	59	395
297	24,338	504	266	0	155	925
298	1,867	52	19	0	0	71
Total	121,072	1,429	1,954	615	555	4,537
Percent of Total		31	43	14	12	

SOURCE: Zaborske, 1991b.

Table 2-4
Summary of Long-term, Short-term, and Temporary Roads by VCU for Alternative 3 (in miles)

VCU	Long-term	Short-term	Temporary	Total
293	15.44	9.16	9.60	34.20
294	12.75	7.88	3.89	24.52
296	8.02	3.48	0.75	12.25
297	17.19	2.64	3.05	22.88
298	1.17	0	0	1.17
314	0	0	0	0
315	0.04	0	0	0.04
Total	54.61	23.16	17.29	95.06
Percent of Total	57	25	18	

SOURCE: Costa, 1991.

Proposed Harvest Units or Combination of Harvest Units Over 100 Acres for Alternative 3

Unit Number(s)	Total Acres	Factors Considered
114	119	Logging system requirements (isolated timber) and economics. Blocks of isolated timber would be created which would be uneconomical to harvest in the future if left out of this unit now.
204	108	Logging system requirements (isolated timber) and economics. Blocks of isolated timber would be created which would be uneconomical to harvest in the future if left out of this unit now.
213	122	Logging system requirements (isolated timber) and economics. Blocks of isolated timber would be created which would be uneconomical to harvest in the future if left out of this unit now.
221	114	Logging system requirements (isolated timber) and economics (helicopter unit, very costly to split apart and harvest in 2 entries).
223	146	Logging system requirements (isolated timber) and economics (helicopter unit, very costly to split apart and harvest in 2 entries).

Unit Number(s)	Total Acres	Factors Considered
235	118	Logging system requirements (isolated timber) and economics (helicopter unit, very costly to split apart and harvest in 2 entries).
244	115	Logging system requirements and economics (helicopter unit, very costly to split apart and harvest in 2 entries).
106, 109	125	This combination of units allows retention of important wildlife travel corridors.
207, 247	103	Visual resource considerations and potential for blowdown if patch of timber left.
419, 420	132	Visual and wildlife resource considerations. This combination of units allows retention of important wildlife travel corridors.
422, 423	151	Wildlife resource considerations and logging system requirements (isolated timber). Wildlife resource considerations and logging system requirements (isolated timber). Wildlife resource considerations for having vertical units up and down the slope, instead of across the slope. Better for wildlife movement.

Enhancement Opportunities Identified with Alternative 3

The following enhancement opportunities are possible under Alternative 3:

- Long-term roads will probably be utilized by Off-Road Vehicle (ORV) traffic, until the alder growth takes over. Some of these roads will be maintained in an open status, but not to low clearance vehicles. In addition, the long-term roads in Saook Bay (VCU 294) could be maintained for recreational use, with the alder removed, if there is sufficient public demand. These travel routes could be developed to offset the unplanned use of ORVs currently occurring in the False Island area.

- Fish habitat enhancement through activities such as soil stabilization, stream rehabilitation, stream bank stabilization, and salmon rearing improvements could be scheduled using KV or program funding in the following sub-watersheds for this alternative. These activities would increase either the quantity of habitat or quality of in stream habitat for anadromous species.

Sub-Watershed Number	Reference Location	Units Within the Sub-watershed Area
P81A	Appleton	107, 109, 113, 122, 126
Q11A	Saook	215, 222, 223
Q11C	Saook	225, 228

- Second growth management activities would be scheduled in regenerated stands for potentially improving deer winter range characteristics. These activities could be accomplished through either KV or program funding.

Sub-watershed Number	Reference Location	Units Within the Sub-watershed Area
P81A	Appleton	103, 126, 133, 158
Q33A	Hanus Bay	320, 321, 323, 328, 329
Q16A	N. Catherine Is.	315, 317, 360
Q42A	S. Catherine Is.	449

- Precommercial thinning to improve timber production is projected for the areas listed below. These areas would be investigated for desirability for thinning between 10 and 12 years after harvest.

VCU	Units
293	111, 113, 122, 143, 144
294	211, 213, 221, 226, 244
296	317, 323, 328, 332, 341
297	414, 419, 425, 449

- Hand planting to maintain current species composition or to meet National Forest Management Act (NFMA) requirements for adequate stocking is estimated in the following areas:

VCU	Units
293	104, 109, 112, 113, 125, 126, 127, 129, 133, 139, 140
294	201, 205, 206, 223, 228, 230, 231, 234, 237, 242
297	400, 402, 408, 411, 416, 420, 426, 433

- A recreation cabin could be constructed in Appleton Cove and/or Hanus Bay.

- A portage trail could be developed between Hanus Bay and Portage Arm.

- A recreation cabin could be constructed in Hanus Bay or Portage Arm.

Monitoring Specific to Alternative 3

There is no monitoring activity projected that is specific to this alternative.

Alternative 4

The theme of this alternative is emphasizing protection of non-timber resources while providing for some timber harvest. This alternative is designed emphasize protection of all non-timber resources through applying a conservative approach to management in the project area. It would protect recreation and fisheries values in the Twin Lakes and Little Little Lake Eva areas of VCU 296 by deferring timber harvest. These areas adjoin Lake Eva (VCU 295) and provide an "oasis" from timber harvest activities on either side. Only those activities which would result in a low risk of adverse impacts would be proposed with this alternative.

Implementation of this alternative would schedule harvest of 3,291 acres, in 102 harvest units for approximately 86.4 MMBF of sawlog and utility volume, indicating an average unit size of 32 acres. To implement this level of harvest, 61 miles of new road would be constructed and 25 miles reconstructed along with six (6) LTFs. This indicates an average of 1.1 MMBF/ mile of road. Table H-3 (Appendix H) shows the units specific to this alternative. Tables H-5 and H-6 show the long-term and short-term roads for all of the alternatives. Map 2-3 provides the spatial relationship between roads, units, and other geographic features of the Kelp Bay Project Area.

Guidelines used in selecting units and roads which would be consistent with protecting non-timber resources and the Twin Lakes area would include the following:

- Defer development activities on the southern two-thirds of Catherine Island, Cosmos Cove, and Clear River to provide undesignated subsistence management areas, and to maintain large blocks of old growth habitat (Issues 3, 4 and 6).

- Protect key water quality and fish-producing streams through eliminating certain units from availability for harvest this entry, when they occur along high fish producing streams (Issue 2).

- Prescribe helicopter yarding in certain areas to limit road access to high value wildlife habitats (bears and deer). Helicopter yarding may also be a useful tool to help meet Visual Quality objectives in both Visual Management Classes 1 and 2, through partial harvesting, or by eliminating the need to construct a road which would be visually distracting to forest viewers (Issues 4, 5, and 6).

- Protect existing and potential recreation opportunities in the Twin Lakes and Little Little Lake Eva areas of Portage Arm VCU (Issue 6).

The following two tables summarize the major associated activities with this proposal, timber harvest and road management strategies, for each VCU. Table 2-5 shows the proposed logging system methods and acres of harvest for each method. More information about the effects of each harvest system can be reviewed in the *Timber* section of Chapter 4.

Table 2-6 summarizes miles of road by road management strategies. Table H-3 (Appendix H) shows the units specific to this alternative. Tables H-5 and H-6 show the long-term and short-term roads, by individual road segments for all of the alternatives.

Table 2-5
Summary of Proposed Timber Harvest by VCU and Logging Methods for Alternative 4

VCU	Estimated Volume (MBF)	Logging Method (by Acres) Highlead	Live Skyline	Helicopter	Slackline	Total
293	16,637	245	329	0	125	699
294	23,237	216	303	282	79	880
296	14,446	0	194	250	43	487
297	14,256	291	230	0	61	582
298	8,350	128	24	160	0	312
314	694	0	0	25	0	25
315	8,735	0	0	306	0	306
Total	86,355	880	1,080	1,023	308	3,291
Percent of Total		27	33	31	9	

SOURCE: Zaborske, 1991b.

Table 2-6
Summary of Long-term, Short-term, and Temporary Roads by VCU for Alternative 4 (in miles)

VCU	Long-term	Short-term	Temporary	Total
293	14.91	4.51	4.55	23.97
294	13.04	3.78	1.93	18.75
296	9.82	0.48	0.69	10.99
297	17.38	3.99	3.61	24.98
298	4.80	0	0.78	5.58
314	0	0	0	0
315	1.86	0	0	1.86
Total	61.81	12.76	11.56	86.13
Percent of Total	72	15	13	

SOURCE: Costa, 1991.

Proposed Harvest Units or Combination of Harvest Units Over 100 Acres for Alternative 4

Unit Number(s)	Total Acres	Factors Considered
244	115	Logging system requirements and economics (helicopter unit, very costly to split apart and harvest in 2 entries).
231,232,234	111	Logging system requirements and economics (units at end of road system, costly to rebuild road to harvest portion of volume in the future).
351, 503	101	These units are in a proposed watershed study area. Unit boundary was adjusted to facilitate study design per request of the hydrologist.

Alternative 4 emphasizes the protection of non-timber resources while providing for some timber harvest. It also maintains recreational opportunities in Portage Arm.

Enhancement Opportunities Identified with Alternative 4

The following are enhancement opportunities possible under Alternative 4:

- A fish ladder could be constructed along Bourbon Creek near unit 518. This enhancement would provide three miles of additional stream habitat for pink salmon.

- Long-term roads will probably be utilized by Off-Road Vehicle (ORV) traffic, until the alder growth takes over. Some of these roads will be maintained in an open status, but not to low clearance vehicles. In addition, the long-term roads in Appleton Cove (VCU 293) could be maintained for recreational use, with the alder removed, if there is sufficient public demand. These travel routes could be developed to offset the unplanned use of ORVs currently occurring in the False Island area.

- Fish habitat enhancement through activities such as soil stabilization, stream rehabilitation, stream bank stabilization, and salmon rearing improvements could be scheduled using KV or program funding in the following sub-watersheds for this alternative. These activities would increase either the quantity of habitat or quality of in-stream habitat for anadromous species.

Sub-watershed Number	Reference Location	Units Within the Sub-watershed Area
P81A	Appleton	107, 109, 126
Q11A	Saook	222, 223
Q11C		225, 228
T82A	South Arm	728

- Second growth management activities would be scheduled in regenerated stands for potentially improving deer winter range characteristics. These activities could be accomplished through either KV or program funding.

Sub-watershed Number	Reference Location	Units Within the Sub-watershed Area
P81A	Appleton	103, 126, 158
Q33A	320, 322, 323, 328,	
		329, 330, 353
Q42A	N. Catherine Is.	449
Q45A		427
Q63A	Middle Arm	511, 518
T82A	South Arm	639, 723, 724, 726, 729
T81A		710, 711, 714, 732

- Precommercial thinning to improve timber production is projected for the areas listed below. These areas would be investigated for desirability for thinning between 10 and 12 years after harvest.

VCU	Units
293	143
294	244
296	323, 341
297	414, 419, 449
315	710

- Hand planting to maintain current species composition or to meet National Forest Management Act (NFMA) requirements for adequate stocking is estimated in the following areas:

VCU	Units
293	104, 109, 125, 126, 127, 129, 139, 140
294	201, 206, 228, 231, 232, 234, 237, 242
297	402, 408, 411, 439
298	509, 511, 535
315	710, 728, 729, 730

- A trail up Saook Creek could be constructed for bear watching, freshwater fishing, and day hiking.

- A portage between Hanus Bay and Portage Arm could be constructed.

Alternative 5

The theme of this alternative is maximizing availability of timber within the Project Area to APC, while still meeting project standards and guidelines. This alternative is designed to evaluate effects of harvesting as much of the Project Area as possible in a combination that still meets standards and guidelines.

Implementation of this alternative would schedule harvest of 8,419 acres, in 205 harvest units for approximately 229.7 MMBF of sawlog and utility volume, indicating an average unit size of 41 acres. To implement this level of harvest, 116 miles of new road would be constructed and 34 miles reconstructed along with the construction of nine (9) LTFs. This indicates an average of 1.5 MMBF/mile of road. Table H-4 (Appendix H) shows the units specific to this alternative. Tables H-5 and H-6 show the long-term and short-term roads for all of the alternatives. Map 2-4 provides the spatial relationship between roads, units and other geographic features of the Kelp Bay Project Area.

Guidelines used in selecting units and roads which would be consistent with emphasizing timber production in the Project Area would include the following:

- Maintain wildlife habitats in areas not designated for timber harvest, i.e. LUD II VCUs adjoining the Project Area (Issue 4).

- Emphasize roaded modified recreation opportunities throughout the project area (Issue 6).

- Make available more than 100 MMBF of timber volume with this EIS, to limit the need to enter more separate project areas on the Sitka Ranger District before 1995 (Issues 1, 7, and 8)

- Emphasize long term timber production and road access through harvesting in most watersheds in the Project Area (Issue 8).

The following two tables summarize the major associated activities with this proposal, timber harvest and road management strategies for each VCU. Table 2-7 shows the proposed logging system methods and acres of harvest for each method. More information about the effects of each harvest system can be reviewed in the *Timber* section of Chapter 4.

Table 2-7

Summary of Proposed Timber Harvest by VCU and Logging Methods for Alternative 5

VCU	Estimated Volume (MBF)	Logging Method (by Acres) Highlead	Live Skyline	Helicopter	Slackline	Total
293	37,279	547	835	103	95	1,580
294	56,250	359	827	595	200 SL 48 SH	2,029
296	31,320	281	439	0	233 SL 5 SH	958
297	36,851	778	577	0	105	1,460
298	29,380	204	29	755	63	1,051
314	14,793	358	0	131	42	531
315	23,865	247	363	90	110	810
Total	229,738	2,774	3,070	1,674	848 SL 53 SH	8,419
Percent of Total		33	36	20	10 SL	1 SH

SOURCE: Zaborske, 1991b.
Note: SL = Slackline SH = Shovel

Table 2-8 summarizes miles of road by road management strategies. Table H-4 (Appendix H) shows the units specific to this alternative. Tables H-5 and H-6 show the long-term and short-term roads, by individual road segments for all of the alternatives.

Table 2-8

Summary of Long-term, Short-term, and Temporary Roads by VCU for Alternative 5 (in miles)

VCU	Long-term	Short-term	Temporary	Total
293	13.96	11.27	10.65	35.88
294	12.75	8.94	4.51	26.20
296	4.71	10.14	2.63	17.48
297	27.77	8.57	4.83	36.17
298	6.08	2.65	0.84	9.57
314	3.04	2.60	1.69	7.33
315	12.47	1.52	3.44	17.43
Total	75.78	45.69	28.59	150.06
Percent of Total	50	30	20	

SOURCE: Costa, 1991.

Loading logs at a landing. Alternative 5 emphasizes making the most timber a vailable to APC while still meeting environmentally sound standards and guidelines.

Proposed Harvest Units or Combination of Harvest Units Over 100 Acres for Alternative 5

Unit Number(s)	Total Acres	Factors Considered
114	119	Logging system requirements (isolated timber) and economics. Blocks of isolated timber would be created which would be uneconomical to harvest in the future if left out of this unit now.
128	144	Logging system requirements and economics (unit at end of road system, costly to rebuild road to harvest portion of volume in the future).
204	108	Logging system requirements (isolated timber) and economics. Blocks of isolated timber would be created which would be uneconomical to harvest in the future if left out of this unit now.
213	122	Logging system requirements (isolated timber) and economics. Blocks of isolated timber would be created which would be uneconomical to harvest in the future if left out of this unit now.
221	114	Logging system requirements (isolated timber) and economics (helicopter unit, very costly to split apart and harvest in 2 entries).
235	118	Logging system requirements (isolated timber) and economics (helicopter unit, very costly to split apart and harvest in 2 entries).
244	115	Logging system requirements and economics (helicopter unit, very costly to split apart and harvest in 2 entries).
302	152	Logging system requirements (isolated timber) and economics. Blocks of isolated timber would be created which would be uneconomical to harvest in the future if left out of this unit now.
506	111	Visual resource considerations, logging system requirements, and economics (helicopter unit, very costly to split apart and harvest in 2 entries).
522	122	Visual resource considerations, logging system requirements, and economics (helicopter unit, very costly to split apart and harvest in 2 entries).
308, 309, 310	127	Timber is located at the end of a road system; isolated timber would result which would be uneconomical to harvest in the future if left out of this unit now.
106, 109	125	This combination of units allows retention of important wildlife travel corridors.

Unit Number(s)	Total Acres	Factors Considered
207, 247	103	Potential for blowdown if patch of timber left.
219, 220	102	Units at the end of the road system and would be uneconomical to rebuild entire road system to get one unit in the future.
419, 420	132	Visual and wildlife resource considerations. This combination of units allows retention of important wildlife travel corridors.
422, 423	151	Wildlife resource considerations and logging system requirements (isolated timber). Wildlife resource considerations for having vertical units up and down the slope, instead of across the slope. Better for wildlife movement.
621, 622	104	Units were taken up the hill to blend into existing landslide patches and brush fields to reduce the visual impacts to viewers in South Arm of Kelp Bay.
723, 724	131	Economics (units at end of road system, costly to rebuild road to harvest 1 unit in the future).

Enhancement Opportunities Identified with Alternative 5

The following are possible enhancement opportunities under Alternative 5:

- A fish ladder could be constructed along Bourbon Creek near unit 518. This enhancement would provide three miles of additional stream habitat for pink salmon.

- Long-term roads will probably be utilized by Off-Road Vehicle (ORV) traffic, until the alder growth takes over. Some of these roads will be maintained in an open status, but not to low clearance vehicles. In addition, the long-term roads on Catherine Island (VCU 297) could be maintained for recreational use, with the alder removed, if there is sufficient public demand. These travel routes could be developed to offset the unplanned use of ORVs currently occurring in the False Island area. The roads into Twin Lakes (7530) would be closed to all traffic to protect fish resources.

- Fish habitat enhancement through activities such as soil stabilization, stream rehabilitation, stream bank stabilization, and salmon rearing improvements could be scheduled using KV or program funding in the following sub-watersheds for this alternative. These activities would increase either the quantity of habitat or quality of in stream habitat for anadromous species.

Sub-watershed Number	Reference Location	Units Within the Sub-watershed Area
P81A	Appleton	107, 109, 113, 119, 120, 122, 126
Q11A	Saook	215, 222
Q32A	Hanus Bay	307, 309
Q41A	N. Catherine	400
Q64A	Middle Arm	522, 525, 526, 619 620
T82A	South Arm	728

- Second growth management activities would be scheduled in regenerated stands for potentially improving deer winter range characteristics. These activities could be accomplished through either KV or program funding.

Sub-watershed Number	Reference Location	Units Within the Sub-watershed Area
P81A	Appleton	102, 103, 126, 133, 134, 158
Q32A	Hanus Bay	311
Q33A	Hanus Bay	320, 321, 323, 328, 329
Q16A	Little Eva	315, 316, 317
Q42A	N. Catherine Is.	449
Q45A	S. Catherine Is.	427, 428
Q63A	Middle Arm	511, 518
Q64A	Middle Arm	521, 527
T82A	South Arm	637, 639, 723, 724, 725, 726, 727, 729, 638
T81A	The Basin	710, 711, 714, 732

- Precommercial thinning to improve timber production is projected for the areas listed below. These areas would be investigated for desirability for thinning between 10 and 12 years after harvest.

VCU	Units
293	111, 113, 118, 122, 143, 144
294	211, 213, 221, 222, 226, 244
296	305, 316, 317, 323, 328
297	414, 419, 425, 427, 428, 436, 448, 449
298	508, 520, 524, 525, 526, 531
314	600, 601, 631
315	707, 709, 710, 713, 715, 720

- Hand planting to maintain current species composition or to meet National Forest Management Act (NFMA) requirements for adequate stocking is estimated in the following areas:

VCU	Units
293	104, 109, 112, 113, 125, 126, 127, 128, 133, 134, 136, 139, 140, 158
294	201, 205, 206, 219, 220, 228, 229, 230, 231, 234, 237, 242
296	308, 313
297	400, 402, 408, 411, 416, 420, 433 437, 438, 439, 440
298	509, 511, 512,523, 529, 531, 534, 535
314	600, 601, 624, 634, 637, 638
315	703, 707, 710, 725, 727, 728, 729, 730

- Recreation cabins could be built in Appleton Cove and Hanus Bay.

- Day-use hiking trails could be developed in Saook Creek, Twin Lakes, Little Little Lake Eva, Clear River, and Cosmos Cove.

- A portage could be constructed between Hanus Bay and Portage Arm.

Comparison of Alternatives

The comparison of alternatives draws together the conclusions from the materials presented throughout the document and provides the results of the analysis in summary form. The following sections provide:

(1) A comparison of alternatives by identified issue;

(2) A comparison of alternatives by proposed activity; and

(3) A comparison of alternatives by environmental consequence.

Comparison of Alternatives by Identified Issue

Chapter 1 lists the issues that are the focus of this Draft EIS. This section compares the alternatives in terms of these issues.

Issue 1: Social and Economic Effects of Timber Harvest Activities

The baseline for comparing the alternatives is Alternative 1, the No-action Alternative. A more detailed analysis of the social and economic effects of timber harvest activities can be found in Chapter 4, *Environmental Consequences.*

Table 2-9 displays the employment (jobs) and personal income (salaries) that are associated with each alternative. The jobs and salaries listed include those both directly and indirectly dependent on the timber industry. The volume of timber harvested for each alternative results in a level of jobs and salaries associated with that volume. Employment is based on the assumption of 8.64 jobs per MMBF harvested. Personal income is based on a wage value of $23,200 per job. However, since Alternatives 2 through 5 provide sufficient volume to maintain current mill operations, the jobs and salaries estimated are current jobs and salaries. It is Alternative 1, which maintains no jobs, that results in a loss of employment in the affected communities. This loss of jobs associated with Alternative 1 would be between 585 and 1,523. Given the assumption of stable mill operations, it is estimated that approximately 860 jobs would be lost.

Table 2-9
Timber Industry Employment and Income for Each Alternative

	Alternative				
	1	2	3	4	5
Total Volume Harvested (MMBF)	0	136	121	86	230
Employment (Jobs)	0	928	826	587	1,570
Personal Income (Million $)	0	21.5	19.2	13.6	36.4

SOURCE: Thomas, 1991.

Alternative 1, the No-action Alternative, would have severe consequences for the ability of the Forest Service to meet its contractual obligations to the APC. Selection of this alternative would most likely result in the Forest Service being unable to meet minimum contract timber volume requirements. Timber supply would likely decline by about 100 MMBF in the APC contract sale area. This could result in mill closures in both Sitka and Wrangell, and would result in fewer jobs in the effected communities.

Mill operator in Wrangell sawmill. Alternatives 2 through 5 would help to maintain timber-related employment in the region.

This would have a ripple effect throughout the various economic sectors in Southeast Alaska that both directly and indirectly benefit from the employment with APC. This loss of direct and indirect employment in the timber industry would be expected to result in slower (possibly negative) population growth in some communities. These consequences of Alternative 1 are expected to produce a significant effect on the timber industry and the economic and social environment dependent on that industry.

Alternatives 2 through 5 would provide sufficient volume to enable the Forest Service to meet contractual obligations to the APC and assist in maintaining timber-related employment in the region. In these alternatives, the total volume harvested ranges from 86 MMBF in Alternative 4 to 230 MMBF in Alternative 5. These volumes would be provide to APC in annual offerings that would maintain the required available volume. As a result, the annual harvest for each of these alternatives would be expected to remain relatively constant, and would not have a significant effect on the timber industry or its dependent employment and income.

None of the alternatives is expected to have a significant impact on the commercial fishing, recreation, or tourism industries.

Issue 2: Water Quality and Fish Habitat

Alternative 1, the No-action Alternative, provides the baseline for comparing the alternatives. Chapter 4 contains the detailed description of the analysis summarized here. All alternatives meet the requirements and intent of the Clean Water Act.

The evaluation in Chapter 4 shows that the potential effects on water quality, stream temperatures, large woody debris recruitment, and stream nutrient cycles are minimal for all alternatives. Adherence to BMPs outlined in the Soil and Water Conservation Handbook (Forest Service [D]) during the design of units and roads minimize the potential effects to these resources and concerns. Also, site-specific BMPs have been developed and were selected to minimize the potential for impact to these resources and concerns. These site-specific BMPs are noted on the individual timber harvest unit and road cards in Appendices D and E.

The Chapter 4 evaluation also uses a relative risk rating system to rate each alternative in terms of the risk of producing a mass wasting event that could result in a short-term stream sediment increase. This rating system does not imply that a mass wasting event will occur that could result in increased stream sedimentation; rather, it ranks the alternatives on the basis of the potential for a mass wasting event occurring which may or may not result in a short-term increase in stream sediment. This increased stream sedimentation may result in some loss or impairment of resident and anadromous fish spawning and rearing habitat. The risk rating is based upon the amount of road constructed, the amount of use, the number of stream crossings, how close the road is to the stream, and the amount of area of high risk soils disturbed. Table 2-10 displays by alternative the miles of road construction and acres of harvest units in high risk areas, acres of riparian area in road crossings, and number of potential drainage structure failures.

Table 2-10
Mass Wasting Risk Rating Factors, by Alternative

Alternative	Miles of Road Construction	Acres of Harvest Units	Acres of Riparian Area in Road Crossings	Number of Potential Drainage Structure Failures
1	0.0	0	0.0	0
2	8.92	733	42.82	30
3	5.26	547	29.75	22
4	4.54	368	26.80	14
5	8.42	1,221	54.97	40

SOURCE: Paustian et al., 1991.
Note: Miles of Road Construction and Acres of Harvest Units are not the totals for the alternatives, they are only the total acres that occur in high risk areas.

Using this relative risk rating, Alternative 1 (No Action) would have the lowest risk of accelerated mass wasting, followed by Alternative 4, Alternative 3, Alternative 2, and Alternative 5. However, by adhering to BMPs during design of harvest units and roads, the miles of road construction and acres of harvest units in high potential areas, the number of acres of riparian area impacted, and the number of hazard road crossings were minimized.

Recent research on the Tongass National Forest (Swanston and Marion, 1991) estimates that the incidence of management-related landslides may increase 3.5 times from the natural rate but that there is only a very slight chance that major impacts to fish habitat would occur.

This historical photo shows herring eggs being dried on kelp. Effects on subsistence from implementation of the action alternatives are discussed in Chapter 4.

Issue 3: Subsistence

Chapter 4 evaluates the potential of site-specific effects on subsistence that could result from implementing any of the proposed timber harvest and associated road construction alternatives.

Based on potential direct and cumulative effects of timber harvest, there is a significant possibility of a significant restriction of subsistence use of deer in the Project Area under all alternatives. The proposed alternatives do not present a similar significant possibility of significantly restricting other subsistence uses.

Small informal public meetings held in Angoon helped identify areas of importance for subsistence. The Basin is an important area for gathering seal which provides meat and oil as part of their diet. Catherine Island was identified for its deer hunting. Through dives conducted in June of 1990, the U.S. Fish and Wildlife Service identified the South Arm of Kelp Bay, Appleton Cove, and Hanus Bay as important shellfish habitat. The U.S. Forest Service will hold subsistence hearings on this Draft EIS in Angoon and Sitka in conformance with Section 810 of ANILCA. The hearings will give affected communities further opportunity to provide additional information concerning potential subsistence use impacts associated with the proposed timber harvest alternatives in the Kelp Bay Project Area.

Issue 4: Wildlife

Chapter 4 contains the detailed evaluation of the potential effects of timber harvest activities on wildlife habitat and wildlife habitat capability. A summary of the results of this evaluation is presented in this section.

The baseline comparing alternatives is the No-action Alternative (Alternative 1) for wildlife habitat. Two points in time were used to evaluate the extent of potential effects to wildlife habitat. The year 1990 was chosen to represent the current, existing condition. Since it is projected that timber harvest activities will occur in the Kelp Bay Area between 1992 and 1995, 1995 will be used to determine total impacts to wildlife habitat as a result of the proposed actions.

Table 2-11 displays the acres proposed for harvest in each of the seven major wildlife habitats and the percent reduction in habitat from the current condition.

Table 2-11
Acres and Percent of Wildlife Habitats Proposed for Harvest, by Alternative

	Alternative 1		2		3		4		5	
Habitat	Acres Cut	Percent Decline	Acres Cut	Percent Decline	Acres Cut	Percent Decline	Acres Cut	Percent Decline	Acres Cut	Percent Decline
Beach Fringe	0	0	6	<1	0	<1	<1	<1	88	1
Estuary Fringe	0	0	48	<1	36	<1	8	<1	94	2
Old-Growth Forest	0	0	5,094	10	4,537	9	3,291	6	8,419	17
Riparian	0	0	587	6	283	3	357	4	798	9
Forest	0	0	5,094	5	4,537	5	3,291	3	8,419	8
Alpine/ Subalpine	0	0	32	<1	29	<1	16	<1	52	<1

SOURCE: Weber, 1991.
Note: Habitats overlap so Acres Cut column does not add up to reflect actual acres planned for harvest by alternative. For example, acres of old-growth that occur in the beach fringe are counted in the old-growth habitat, beach fringe habitat, and forested habitat.

The pronounced direct effect on wildlife habitats in all action alternatives would be loss of old-growth and forest habitat. Impacts to other habitats would be greatly reduced through unit and road design prior to alternative formulation. Alternative 1, No Action, would have no effect on wildlife habitats while Alternative 5 would have the same or greater impact on each of the habitats as the other alternatives. Alternative 2 would have the second greatest impact on wildlife habitats, followed by Alternative 3 and then Alternative 4. However, all alternatives would result in impacts consistent with implementation of the current Tongass Land Management Plan.

Table 2-12 displays the potential reduction in wildlife habitat capabilities for the 11 key Management Indicator Species (MIS) found in the Kelp Bay Planning Area, as calculated by GIS computer models. This table displays the pre-APC long-term contract habitat capability and the estimated reduction in this capability after the actions proposed at this time (year 1995). Habitat capability is a means to measure potential effects. Habitat capability does not necessarily indicate current or future populations.

Table 2-12
Potential Reduction In Habitat Capability for MIS in 1995, by Alternative

		Potential Reduction Alternative				
Habitat Capability	**Pre-1961**	**1**	**2**	**3**	**4**	**5**
Sitka Black-tailed Deer	2,446	0	301	235	210	448
Mountain Goat	89	0	<1	0	<1	1
Brown Bear	209	0	5	4	3	9
Red Squirrel	79,255	0	4,399	3,910	2,772	7,920
Otter	103	0	<1	<1	1	3
Marten	244	0	15	13	11	27
Brown Creeper	546	0	53	33	24	101
Red-breasted Sapsucker	10,137	0	874	788	568	1,444
Hairy Woodpecker	941	0	87	82	58	157
Vancouver Canada Goose	231	0	8	1	5	12
Bald Eagle	324	0	2	2	1	9

SOURCE: Weber, 1991.
Note: Habitat capability is measured in number of individuals. Also potential reduction by alternatives is based on completion of the proposed actions (1995).

To 1995, all of the action alternatives would decrease habitat capabilities less than 20 percent, and in most cases, less than 10 percent. Alternative 1 would maintain the current habitat capabilities for the MIS while the greatest potential decrease would result under Alternative 5, which proposes to harvest the most old-growth timber. Alternatives 2, 3, and 4 propose to harvest decreasing amounts of old-growth and exhibit respectively higher remaining habitat capabilities. Alternative 3 focuses timber harvest in the Peril Strait VCUs (except for VCU 295) and habitat capabilities would be lower in those VCUs compared to s 2 and 4 which propose to harvest in all VCUs except 295. Under Alternative 3, habitat capabilities would be maintained in VCUs 314 and 315, and in most of 298.

All action alternatives would have some effect on old-growth and forest habitat. However, the effects of all alternatives would be consistent with the current TLMP.

Issue 5: Scenic Quality

Alternative 1 would not affect the current visual character of the Kelp Bay Planning Area and, thus, would have the least effect on the visual resource. Alternative 2 would enter seven VCUs. Timber-harvest and road-building would be more widely distributed under this alternative than under any other action alternative, thus, there would be a moderate impact on the visual resource as a whole. VCUs 298 and 314 would fully meet inventoried VQOs. Portions of VCUs 293, 294, 296, 297, and 315 would not meet inventoried VQOs. The LTFs that would be developed in Appleton Cove, Saook Bay, Hanus Bay, Bourbon Creek, Kelp Bay, South Kelp Bay, and Cosmos Cove would have a strong visual impact when viewed within a foreground distance but little, if any, impact on background views.

Alternative 3 would enter five VCUs. This alternative would maintain the visual resources in greater Kelp Bay in the condition that presently exist. There would be a major impact on the visual resources in Peril Strait from Appleton Cove to Catherine Island, and in Chatham Strait along the east shore of Catherine Island. VCUs 296, 297, and 298 would fully meet inventoried VQOs. Portions of VCUs 293 and 294 would not meet inventoried VQOs. The LTFs that would be developed in Appleton Cove, Saook Bay, and Hanus Bay would have a strong visual impact when viewed within a foreground distance but little, if any, impact on background views.

Alternative 4 would enter six VCUs. This alternative would have a moderate impact on the visual resource in the Project Area. Areas where concentrated harvest will result in strong visual impacts are the slopes northeast of Appleton Cove, the slopes northeast of Saook Bay, and the slopes on the northeast end of Catherine Island. VCUs 298 and 315 would fully meet inventoried VQOs. Portions of VCUs 293, 294, 296, and 297 would not meet inventoried

VQOs. LTFs that would be developed in Appleton Cove, Saook Bay, Hanus Bay, Bourbon Creek, Kelp Bay, and South Kelp Bay would have a strong visual impact when viewed within a foreground distance but little, if any, impact on background views.

Alternative 5 would enter seven VCUs. The large-scale land disturbance associated with this alternative would have a strong impact on the viewable landscape of the Project Area. VCU 298 will meet the inventoried VQO. Portions of VCUs 293, 294, 296, 297, 314, and 315 would not meet inventoried VQOs. LTFs that would be developed in Appleton Cove, Saook Bay, Hanus Bay, Bourbon Creek, Kelp Bay, South Kelp Bay, South Arm, North South Arm, and Cosmos Cove would have a strong visual impact when viewed within a foreground distance but little, if any, impact on background views. More detailed information on the visual resource can be found in Chapter 4, *Environmental Consequences*.

Sport fishing from a float plane. Scenic quality and solitude are important features of the Kelp Bay Project Area.

Issue 6: Recreation

Table 2-13 displays the percent of the total Project Area that would be remaining in the various Recreation Opportunity Spectrum (ROS) classes following implementation of each alternative. Since VCU 295 is classified LUD II, no timber harvest or road construction is proposed under any alternative in this VCU. Because of this, there would be no change to the ROS classes in this VCU.

Table 2-13
Percent of Project Area Remaining in Each ROS Class Following Alternative Implementation

ROS Class	Alternative 1	2	3	4	5
Primitive (PRIM)	46	36	41	36	31
Semi-Primitive Non-Motorized (SPNM)	43	36	37	41	39
Semi-Primitive Motorized (SPM)	4	5	4	5	5
Roaded Modified (RM)	7	23	18	18	25

SOURCE: Nelson, 1991.

Recreational activities in the Kelp Bay Project Area are largely confined to the accessible shorelines and the upland areas easily reached from these shorelines. Changes in the recreation opportunities which occur in these areas have a greater effect on the recreational user than changes which may occur elsewhere in the Project Area. Table 2-14 displays the shoreline miles in each ROS Class by alternative as a percent of total shoreline miles in the Project Area.

Table 2-14
Shoreline Miles in Each ROS Class Following Alternative Implementation (Displayed as a Percent of Total Shoreline Miles in the Project Area)

ROS Class	Alternatives 1	2	3	4	5
Primitive (PRIM)	9	4	9	5	0
Semi-Primitive Non-Motorized (SPNM)	40	14	21	18	23
Semi-Primitive Motorized (SPM)	24	31	32	35	29
Roaded Modified (RM)	27	51	38	42	48

Source: Nelson, 1991.

Alternative 1 would result in no change to the current ROS classifications of Primitive (PRIM), Semi-Primitive Non-Motorized (SPNM), Semi-Primitive Motorized (SPM), and Roaded Modified (RM). It provides a baseline for comparing the effects of the alternatives on the recreation resource. Although the Project Area is predominantly undeveloped, six

areas have been modified through road construction and timber harvest activities. Only 7 percent of the acres and 27 percent of the shoreline miles have been identified as occurring in the Roaded Modified ROS class.

Alternatives 2 and 5 harvest new areas within the Project Area, as well as increase the size of the six existing developed areas with additional road construction and timber harvest. In addition, the use of boat anchorages in Appleton Cove, Saook Bay, Hanus Bay, Kelp Bay, and Cosmos Cove would be affected for 3 to 5 years due to LTFs, logging camps, and log raft storage that would occur during timber harvest activities. This new activity results in approximately 24 percent of the acres and 50 percent of the shoreline miles occurring in the Roaded Modified ROS class. This is a significant increase in the development of the Project Area, especially in the shoreline and associated upland areas where most recreation takes place. The result would be a significant effect on those people currently seeking primitive or semi-primitive recreation opportunities within the Project Area.

Alternatives 3 and 4, for the most part, would limit activities to areas of existing development with some additional road construction and timber harvest, although each alternative utilizes a different approach. In Alternative 4, the use of boat anchorages in Appleton Cove, Saook Bay, Hanus Bay, and Kelp Bay would be effected for 3 to 5 years due to LTFs, logging camps, and log raft storage that would occur during timber harvest activities. Alternative 3 limits activities to Appleton Cove, Saook Bay, and Hanus Bay. This proposed activity results in approximately 18 percent of the acres and 40 percent of the shoreline miles occurring in the Roaded Modified ROS class. This is also a significant increase in development, especially in the shoreline and associated upland areas. The result would also be a significant effect on those people currently seeking primitive or semi-primitive recreation opportunities within the Project Area; however, it is less than for Alternatives 2 and 5. See Chapter 4, *Environmental Consequences*, for a more detailed discussion of the recreation resource.

Issue 7: Marine Environment

Alternative 1 provides the baseline for comparing the alternatives. Chapter 4 contains the detailed results of the analysis summarized here. Direct effects to the marine environment are assumed to occur only from development of LTFs and are limited to the intertidal area impacted by rock fill and either the intertidal or subtidal areas potentially impacted by accumulation of bark debris.

A total of 12 potential LTF locations are considered for development. However, the maximum number of LTFs that would be developed would be 9 as in some areas there are 2 or 3 possible LTF locations. Figure 2-1 displays all possible LTF locations, in which alternatives they would occur, and whether they are located in the estuary or marine system.

Table 2-15 displays the number of LTFs developed, the total acreage, and percent of estuarine and marine habitat directly impacted under each alternative.

Figure 2-1
Potential LTF Locations and System in Where They Occur, by Alternative

VCU	LTF Name	Alternatives 1	2	3	4	5	System Impacted: Estuary	Marine
293	Appleton Cove *or*		●	●	●	●	●	
293	SE Rodman Bay *or*							●
292	Rodman Bay							●
294	Saook Bay		●	●	●	●		●
296/297	Hanus Bay *or*		●	●	●	●	●	
296/297	North Hanus Bay							●
298	Bourbon Creek		●		●	●		●
314	South Arm					●	●	
314	North Point					●		●
315	North Basin		●		●	●		●
315	South Basin		●		●	●		●
315	Cosmos Cove		●			●		●
	Total LTFs	0	7	3	6	9		

SOURCE: Bums, 1991.

Table 2-15
Number of LTFs Developed and Acreage of Direct Impact to Estuarine and Marine Systems, by Alternative

Alternative	LTFs Developed	Estuarine System Potential Maximum Directly Impacted* Acres	Percent	Marine System Potential Maximum Directly Impacted* Acres	Percent
1	0	0.0	0.00	0.0	0.00
2	7	2.8	0.48	15.3	0.21
3	3	2.8	0.48	7.9	0.11
4	6	2.8	0.48	14.9	0.20
5	9	3.1	0.32	18.4	0.24

SOURCE: Bums, 1991.
*Note: Exact numbers of estuarine and marine acres impacted is not known at this time as it will depend upon whether LTFs in VCUs 293 and 296/297 will be located in the estuary or marine system. The values displayed are maximums for each case. For example, if under Alternative 3 one LTF is selected in the estuary and the other two are located in the marine system, the acres of estuarine system impacted would be less than 2.8 and the acres of marine system impacted would be less than 7.9.

The U.S. Fish and Wildlife Service and National Marine Fisheries Service staff conducted subtidal surveys at potential LTF locations.

Alternative 1 would have no additional impact on the marine environment as no LTFs would be developed.

Alternative 2 proposes development of seven LTFs. Maximum direct impacts would be 2.8 acres (0.48 percent) of the estuarine environment in Appleton Cove and Hanus Bay. If neither LTF in the estuary were developed, a total of 15.3 acres (0.21 percent) of the marine system environment would be impacted. Loss of habitat at each of the LTF sites represents less than 1 percent and is considered to be a very minor effect.

Alternative 3 proposes development of three LTFs. Maximum direct impacts would be 2.8 acres (0.48 percent) of the estuarine environment in Appleton Cove and Hanus Bay. If neither LTF in the estuary were developed, a total of 7.9 acres (0.11 percent) of the marine system environment would be impacted. Loss of habitat at each of the LTF sites represents less than 1 percent and is considered to be a very minor effect.

Alternative 4 proposes development of six LTFs. Maximum direct impacts would be 2.8 acres (0.48 percent) of the estuarine environment in Appleton Cove and Hanus Bay. If neither LTF were developed in the estuary, a total of 14.9 acres (0.20 percent) of the marine system environment would be impacted. Loss of habitat at each of the LTF sites represents less than 1 percent and is considered to be a very minor effect.

Alternative 5 proposes development of nine LTFs. This alternative would develop an LTF at the head of South Arm in addition to Appleton Cove and Hanus Bay. Maximum direct impacts would be 3.1 acres (0.32 percent) of the estuarine environment. If the LTFs in Hanus Bay and Appleton Cove estuaries were avoided, there would be a direct impact to 18.4 acres (0.24 percent) of the marine system habitat. Loss of habitat at each of the LTF sites, represents less than 1 percent and is considered to be a very minor effect.

For all action alternatives, the area of potential effect at the LTF sites is less than 1 percent of the marine habitat in the Kelp Bay Project Area. Since all species identified along the subtidal survey transects were common throughout Southeast Alaska, it is concluded that there would be a non-significant impact to the marine environment from constructing LTFs at the proposed sites.

Issue 8: Timber

Chapter 4 contains the detailed analysis which is summarized here. There are approximately 4,955 acres of existing timber harvest units in the Kelp Bay Project Area. Over 87 percent (4,328 acres) of these previously harvested acres have been certified as being adequately stocked with desirable tree species. The remaining acres need to be surveyed and either certified as being adequately stocked with desirable tree species or scheduled for fill-in hand-planting.

Table 2-16 displays acres of past harvest, acres of proposed harvest, total harvest, and the effects of total harvest on tentatively suitable forest land, commercial forest land (CFL) and total land area, by alternative.

Table 2-16
Acres of Past, Proposed and Total Timber Harvest, by Alternative

				Percent Harvested		
Alternative	Past Harvest (acres)	Proposed Harvest (acres)	Total Harvest (acres)	Tentatively Suitable	CFL	Land Area
1	4,955	0	4,955	12	9	3
2	4,955	5,094	10,049	26	21	7
3	4,955	4,537	9,492	35	20	6
4	4,955	3,291	8,246	22	17	5
5	4,955	8,419	13,374	35	28	9

SOURCE: Zaborske, 1991b.

Alternative 5 proposes to harvest the highest number of acres at this time (8,419 acres), followed by Alternative 2 (5,094 acres), Alternative 3 (4,537 acres), Alternative 4 (3,291 acres) and Alternative 1 (No Action) proposes no timber harvest at this time. Alternative 5 is the only alternative that would complete the first entry in the Kelp Bay Project Area (harvesting one-third, or 33 percent, of the tentatively suitable forest land). All other alternatives would have a cumulative harvest of less than 33 percent of tentatively suitable forest land. Even though Alternative 5 proposes to harvest 3,325 acres more than Alternative 2, 3,382 acres more than Alternative 3, and 5,128 acres more than Alternative 4, the difference between all action alternatives in total land area harvested would be less than 4 percent. Alternative 1 would only harvest 3 percent of the total land, that coming from past harvest.

Table 2-17 displays the estimated total volume to be harvested under each alternative, and acres proposed for harvest by volume class. Since there is no known Volume Class 7 in the Kelp Bay Project Area, it is not shown. These volumes are estimates based upon information available at this time. Actual volumes will be determined by a timber cruise done on the acres made available to APC. Figure 2-2 shows the percentage of each volume class that is proposed for harvest. This data is presented by alternative.

Table 2-17

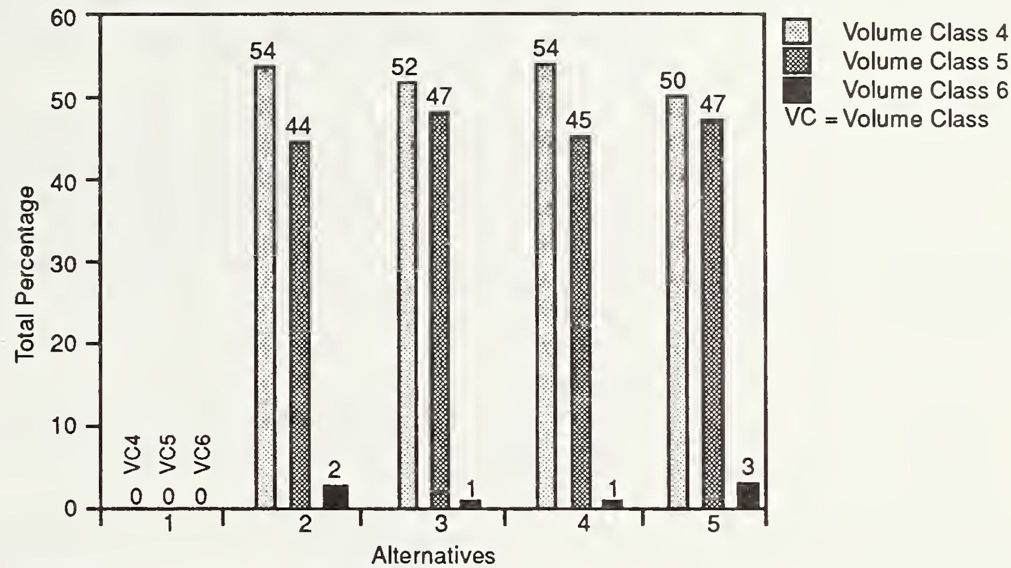
Acres Proposed for Harvest by Volume Class, by Alternative

Alt.	Est. Total Volume (MMBF)	Proposed Total Acres	Volume Class 4 Proposed Acres to be Harvested	Volume Class 5 Proposed Acres to be Harvested	Volume Class 6 Proposed Acres to be Harvested
1	0.0	0	0	0	0
2	136.2	5,094	2,756	2,234	104
3	121.1	4,537	2.386	2,125	26
4	86.4	3,291	1,783	1,492	16
5	229.7	8,419	4,248	3,939	232

SOURCE: Zaborske, 1991b.
Note: Volume Classes 1 through 3 (not shown) contain less than 8 MMBF per acre
Volume Class 4 contains 8 to 20 MMBF per acre
Volume Class 5 contains 20 to 30 MMBF per acre
Volume Class 6 contains 30 to 50 MMBF per acre

All alternatives would meet the proportionality requirement of the 1990 Tongass Timber Reform Act in regard to percentage of Volume Classes 6 and 7 acreage proposed for harvest. All action alternatives would harvest more acres of Volume Class 4 than Volume Class 5. The percentages of Volume Class 4 harvested range from 50 percent in Alternative 5 to 54 percent in Alternatives 2 and 4, with Alternative 3 falling in between these ranges. The percentages of Volume Class 5 harvested range from 44 percent in Alternative 2 to 47 percent in Alternatives 3 and 5, with Alternative 4 falling in between these ranges. Less than 3 percent of the acres harvested in any alternative would be Volume Class 6. Since the No-action Alternative proposes no timber harvest at this time, it would not harvest any acres in any volume class.

Figure 2-2
Total Percentage of Acres Proposed for Harvest by Volume Class, by Alternative



SOURCE: Zaborske, 1991b.

The Forest Plan provides direction for the Project Area to be managed with emphasis on timber production in LUD III and LUD IV areas.

Estimated net timber value is arrived at by subtracting all associated logging costs from the pond value for all proposed harvest units in each action alternative. Thus, individual units which may be uneconomical to harvest by themselves would be offset by other units which are economical to harvest. This would result in less productive lands or lands where the timber is highly defective coming under management, thus increasing future timber yields. Prior to the time the timber is made available to APC, a timber cruise and appraisal will be performed, using current costs and selling values, to determine the volume and value of the timber on the acreage made available to APC.

It is considered appropriate to rank the alternatives in order of estimated net value rather than measuring the specific values because both the volumes and their values are estimates based upon current information and not actual appraisal values or cruised timber volumes. Estimated net value is rounded to the nearest $10 since these numbers are our best estimates. Table 2-18 displays the estimated net value and the ranking of each alternative based upon the net value.

Table 2-18
Summary of Estimated Net Values by Alternative ($/MBF)

Alternative	Estimated[1] Total Volume Harvested (MBF)	Estimated[2] Net Value ($/MBF)	Rank
1	0	$0	Null
2	136,209	$20	3
3	121,072	$40	1
4	87,355	$30	4
5	229,738	$40	2

SOURCE: Zaborske, 1991b.
Note: Negative values are shown in parenthesis ( )

[1] Subject to change based upon results of timber cruise made at time of offering.
[2] Subject to change based upon changes in market value and results of appraisal made at time of offering (rounded to the nearest $10).

On the basis of estimated net timber value, Alternative 3 appears slightly better than Alternative 5. Alternative 2 has about half the net value of Alternatives 3 or 5. As currently designed, Alternative 4 would not be an economic offering.
Table 2-20 displays a summary comparison of the anticipated consequences of each of the alternatives. It is presented by resource as in Chapter 3 and 4.

Comparison of Alternatives by Proposed Activity

Table 2-19 presents a summary comparison of the proposed activities for each of the alternatives. It provides a brief and simple comparison of timber harvested by volume class and by harvest method, acres harvested by logging system, miles of road, number of LTFs required, and estimated index value. This table summarizes more detailed information found in Chapter 4, *Environmental Consequences*.

Table 2-19
Comparison of Alternatives by Proposed Activity

Proposed Activity	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5
Timber (% of total harvest)					
Volume Class 4	0	54	52	54	50
Volume Class 5	0	44	47	45	47
Volume Class 6	0	2	1	1	3
Harvest Method (% volume cut)					
Clearcut (% of total)	0	96.1	98.4	89	94.4
Partial Cut (% of total)	0	3.9	1.6	11	1.6
Total Harvest (MMBF)	0	136.2	121.1	86.4	229.7
Logging system (acres by method)					
Highlead	0	1,508	1,429	880	2,774
Skyline	0	1,304	1,954	1,080	3,070
Helicopter	0	1,477	615	1,023	1,674
Shovel	0	0	0	0	53
Slackline	0	805	539	308	848
Total	0	5,094	4,537	3,291	8,419
Roads (miles)					
Long-term	0	84	55	62	76
Short-term	0	19	23	13	46
Temporary	0	17	17	11	28
Total miles	0	120	95	86	150
Log Transfer Facilities					
LTFs	0	7	3	6	9
Logging camps	0	6	3	6	6
Estimated Net Value ($/MBF, rounded to nearest $10)	0	$20	$40	$30	$40

Comparison of Alternatives by Environmental Consequences

Table 2-19 presents a summary comparison of the proposed activities for each of the alternatives. It provides a brief and simple comparison of timber harvested by volume class and by harvest method, acres harvested by logging system, miles of road, number of LTFs required, and estimated index value. This table summarizes more detailed information found in Chapter 4, *Environmental Consequences.*

Table 2-20

Comparison of Alternatives by Environmental Consequences

Environmental Consequence	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5
Timber					
Seedling/sapling	6%	15%	14%	12%	21%
Closed forest	4%	4%	4%	4%	4%
Mature even-age	1%	1%	1%	1%	1%
Old-growth	89%	80%	81%	83%	74%
Significance	None	Minor	Minor	Minor	Moderate
Floodplains					
Percent of total affected	0	1.4	1.5	1.3	4.9
Significance	0	Negligible	Negligible	Negligible	Negligible
Wetlands					
(% of total affected)	0	1.5	1.1	1.1	1.8
Significance	None	Negligible	Negligible	Negligible	Negligible
Wildlife Habitats [1] (% of total acres)					
Beach fringe	0	<1	0	<1	1
Significance	None	Negligible	None	Negligible	Negligible
Estuary Fringe	0	<1	<1	<1	2
Significance	None	Negligible	Negligible	Negligible	Negligible
Old-growth forest	0	10	9	6	17
Significance	None	Minor	Minor	Minor	Minor
Riparian	0	6	3	4	9
Significance	None	Negligible	Negligible	Negligible	Negligible
Forest	0	5	5	3	8
Significance	None	Negligible	Negligible	Negligible	Negligible
Alpine/Subalpine	0	<1	<1	<1	<1
Significance	None	Negligible	Negligible	Negligible	Negligible

1 The signficance of changes in wildlife habitats also reflect the changes in habitat capabilities for MIS.

Table 2-20 (Continued)

Comparison of Alternatives by Environmental Consequences

Environmental Consequence	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5
Watershed and Fish					
Percent increase in potential landslide and sediment production	0	15	14	9	25
Significance	0	Minor	Minor	Negligible	Moderate
% of road miles with sediment delivery potential	0	7.5	5.2	5.8	5.3
Significance	None	Negligible	Negligible	Negligible	Negligible
% of harvest areas with sediment delivery potential	0	17.4	12.1	11.1	14.5
Significance	None	Minor	Minor	Minor	Minor
% of riparian area affected by road crossings	0	<1	<1	<1	<1
Significance	None	Negligible	Negligible	Negligible	Negligible
Recreation					
% decrease in primitive and semiprimitive nonmotorized going to roaded modified	0	17	11	12	19
Significance	None	Minor	Minor	Minor	Minor
Visuals					
% increase in modification and maximum modification	0	22	18	18	32
Significance	None	Minor	Minor	Minor	Moderate
Marine					
% of total estuarian habitat affected	0	0.48	0.48	0.48	0.32
Significance	None	Negligible	Negligible	Negligible	Negligible
Percent of total marine habitat affected	0	0.21	0.11	0.11	0.24
Significance	None	Negligible	Negligible	Negligible	Negligible

Table 2-20 (Continued)
Comparison of Alternatives by Environmental Consequences

Environmental Consequence	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5
Land Status					
Acres within a selection area	0	140	10	160	330
Cultural					
Impacts to known cultural resources	0	0	0	0	0
Significance	None	None	None	None	None
Economic and Social					
Number of jobs provided	0	928	826	587	1,570
Salaries	0	$21.5 mil.	$19.2 mil.	$13.6 mil.	$36.4 mil.
Subsistence					
Significant possibility of a significant restriction	Yes	Yes	Yes	Yes	Yes

Identification of the Forest Service Preferred Alternative

A Preferred Alternative has been identified from the range of alternatives presented in this Draft EIS. This Preferred Alternative and proposed action is Alternative 3. The identified Preferred Alternative will be examined before preparation of a Final EIS, taking into consideration public comments received, as well as additional information and analysis.

Chapter 3

Affected Environment

Chapter 3

Affected Environment

Introduction

This chapter provides information about the existing environment of the Kelp Bay Project Area that may be affected by implementing any of the alternatives described in Chapter 2. It includes discussions of physical, biological, cultural, economic, and social environments. These environments are expected to be altered for both the short term and long term on the basis of decisions made in the Tongass Land Management Plan (TLMP) (1979) and Amendment (1985-1986) that portions of the Kelp Bay Project Area be managed for intensive resource use and development.

Along with meeting the social and economic needs for timber harvest, fish and wildlife habitat would be altered, soil would be disturbed, viewsheds would be changed, and recreation and subsistence patterns would be disrupted. These impacts are largely unavoidable and allow other areas of the national forest to remain pristine. Interdisciplinary Team interaction during project planning focused on balancing the need for timber with the protection of other resource values. This chapter provides the resource baseline information against which to measure the anticipated impacts from timber harvest.

Timber and Other Vegetation

Western hemlock and Sitka spruce dominate timber stands throughout the Kelp Bay Project Area. Other timber species include Alaska cedar (also known as yellow cedar), mountain hemlock, lodgepole pine (also known as shore pine), and red alder.

Western hemlock and Sitka spruce develop best on well-drained valley bottoms and lower slopes. However, they can also occur anywhere between sea level and the timberline. Both species are harvested for commercial purposes. Alaska cedar occurs in limited numbers in stands throughout the area and is a highly valued commercial species. Lodgepole pine is considered a commercial species but is rarely harvested because it usually does not meet merchantability standards.

Red alder is the major noncommercial species and is often found along beaches and streams and on steeper slopes where soils have been highly disturbed.

Old-Growth Forest

Most of the commercial forest land in the Tongass National Forest that has not been previously harvested and has been undisturbed for centuries is considered old growth. These stands are also commonly referred to as climax plant communities. The definition of old-growth forest varies by species and includes such items as age and size of trees, spacing, snags, canopy layers and structure, and the amount of down material (Forest Service, 1990b). However, in the Kelp Bay Project Area, inventory data only classifies old-growth forest based upon tree age. For this reason, in this document old-growth forest refers to timber stands where the majority of trees are more than 150 years old.

Timber stands with a majority of trees more than 150 years old are considered old-growth forest.

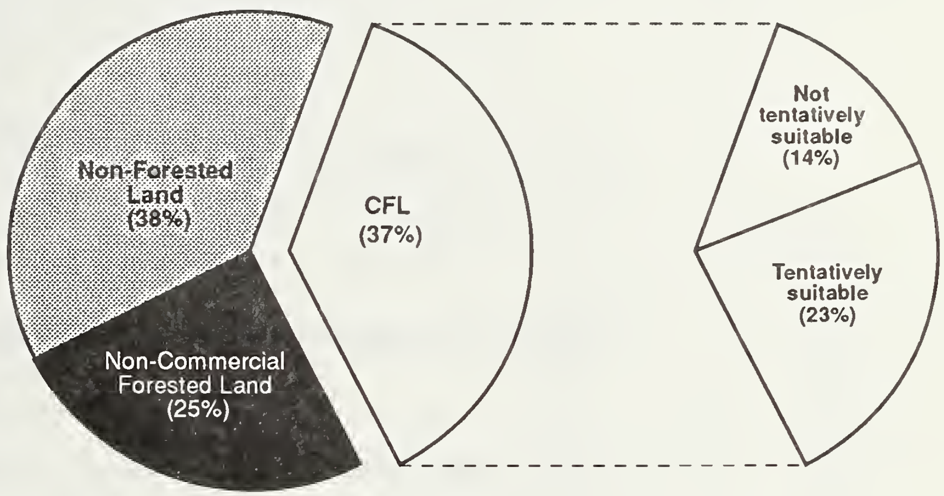
Old growth stands have an uneven appearance because they contain trees of many ages, sizes, and condition with many dead tops and snags. In contrast, stands that have been disturbed during the last 100 to 200 years by fire, landslide, windthrow, or logging have a more uniform appearance because they contain trees of relatively uniform age and size with fewer snags and defective trees. Even-aged stands convert to uneven-aged stands as insects disease, wind, snow, and ice weaken and kill trees, opening up the stand for new growth to enter. The change from even-aged to uneven aged to all-aged is a continuing process. Harvested mature stands are returned to even-aged stands as they regenerate (Harris and Farr, 1974).

Based on past forest inventories, old-growth stands are assumed to have reached an equilibrium in productivity; they no longer increase in biomass. Establishment of new trees depends on the death of existing trees, which provides space in the stand and sunlight through the canopy. Most of the old-growth timber is suitable for the production of pulp. In addition, some Sitka spruce and western hemlock old-growth provide some of the finest quality commercial timber for lumber. Old-growth forest as wildlife habitat is discussed in the *Wildlife* section of this chapter.

Commercial Forest Land

Depending on the vegetative cover, land in the Kelp Bay Project Area has been categorized as forest land or non-forest land (Figures 3-1). Forest land is further categorized as commercial forest land (CFL) or non-commercial forest land. About 37 percent of the land in the Kelp Bay Project Area is CFL, land that is producing or capable of producing continuous crops of timber and that has not been withdrawn from the timber base by statute or administrative action. The Forest Service has specified that in order to be capable of commercial timber production, land must be able to produce 20 cubic feet/acre/year or have 8 thousand board feet (MBF)/acre of net timber volume (Forest Service, 1978). Old-growth and second-growth stands (younger, even-aged stands that grew after removing the previous timber stand) may qualify as CFL.

Figure 3-1
Percentage of Land Types in the Kelp Bay Project Area



SOURCE: Zaborske, 1990.

Commercial forest land in the Tongass National Forest has been classified into volume classes. Each volume class represents a range of timber volume per acre. Placing the timber in volume classes allows the Forest Service to roughly estimate the volume for each VCU. Volume Classes 1 through 3 include CFL containing less than 8 MBF/acre. Volume Class 1 includes non-stocked stands that have been recently burned or logged. Seedling/sapling stands with less than 8 MBF/acre are placed in Volume Class 2, and pole timber stands with less than 8 MBF/acre are placed in Volume Class 3. Volume Classes 4 through 7 contain trees of merchantable size with more than 8 MBF/acre. Table 3-1 displays the volume range for Volume Classes 4 through 7. Table 3-2 shows the acres of CFL in Volume Classes 4 through 6 in the Kelp Bay Project Area by VCU. Since there is no identified Volume Class 7 in the Project Area, it is not displayed. This table displays both gross CFL acres and available CFL acres. Available CFL acres are CFL acres remaining after Tongass Timber Reform Act stream buffers and mandatory 330-foot eagle tree buffers have been removed from the base.

These buffers are unavailable for timber harvest. Available CFL acres are the acreages used for comparison purposes.

Non-CFL is forested land that is not capable of producing commercial quantities or has been withdrawn from the timber base. Non-CFL makes up about 25 percent of the Kelp Bay Project Area. The remaining 38 percent of the Kelp Bay Project Area is classified as non-forest and includes salt marshes and estuaries, alpine areas, and non-timbered mountain tops.

Table 3-1
Timber Volume Range Within Volume Classes

Volume Class	Range of Volume (MBF/Acre)
4	8 - 20
5	20 - 30
6	30 - 50
7	Greater Than 50

SOURCE: Zaborske, 1990.

Table 3-2
Acres of Commercial Forest Land by Volume Class

	Volume Class[1]							
	4		5		6		Totals	
VCU	Gross	Available	Gross	Available	Gross	Available	Gross	Available
293	4,409	4,218	1,274	1,191	0	0	5,683	5,409
294	5,041	4,870	3,578	3,359	328	225	8,947	8,454
295	2,487	2,379	1,500	1,448	422	359	4,409	4,186
296	4,154	3,968	2,885	2,743	659	629	7,698	7,340
297	5,224	4,868	3,050	2,608	129	87	8,403	7,563
298	3,975	3,750	1,860	1,703	74	55	5,909	5,508
314	2,353	2,294	2,215	2,088	90	77	4,658	4,459
315	1,861	1,803	3,229	2,980	0	0	5,090	4,783
Totals	29,504	28,150	19,591	18,120	1,702	1,432	50,797	47,702

SOURCE: Zaborske, 1990.

[1] Volume Classes 1 through 3 (not presented) contain less than 8 MBF/acre; Volume Class 4 contains 8-20 MBF/acre; Volume Class 5 contains 20-30 MBF/acre; Volume Class 6 contains 30-50 MBF/acre; and Volume Class 7 contains 50 or more MBF/acre.

Tentatively Suitable Lands

The TLMP has further classified CFL into normal operable CFL, non-standard operable CFL, or inoperable CFL. Inoperable CFL is forested land on which potential resource damage or physical limitations make harvest of trees impractical and/or uneconomical. This land could be considered unsuitable for timber harvest at this time. The primary difference between normal operable and non-standard operable CFL is that normal stands have less potential for erosion and slope failure than non-standard stands. These lands could be considered tentatively suitable for timber harvest at this time. Because of lower erosion potential, normal operable stands may be logged using common systems including highlead, short, intermediate, long-span skyline (up to 2,600-foot reach); cold deck and swing; track loader; or A-frame.

Logging non-standard operable stands could result in soil erosion or slope failure if careful logging techniques are not used. Non-standard logging techniques, which result in less impact on soils than highlead logging systems, could be employed to log non-standard operable stands. Non-standard techniques include multi-span skyline; long-span skyline (over 2,600-foot reach), and helicopter yarding systems. Table 3-3 displays the acres of tentatively suitable (normal and non-standard operable CFL) forested lands found in the Kelp Bay Planning Area by VCU (also see Figure 3-1). Because VCU 295 is classified LUD II, it is unavailable for timber harvest and is not displayed.

Table 3-3

Acres of Suitable CFL by VCU

VCU	Suitable CFL	Unsuitable CFL	Gross CFL
293	4,631	2,750	7,381
294	5,835	4,227	10,062
296	4,977	4,565	9,542
297	7,355	3,103	10,458
298	4,740	2,615	7,355
314	1,152	2,670	3,822
315	3,804	1,174	4,978
Totals	32,494	21,104	53,598

SOURCE: TLMP Air Photo Points Data Base.

The tentatively suitable selection process has been refined to use data from other resources such as soils and plant associations and to enable the selection process to be done electronically within the Geographic Information System (GIS) data base. (See the Glossary for a description of GIS.) To be considered tentatively suitable, forested land must:

- be at least 10 percent occupied by forest trees;
- be capable of harvest with available technology to ensure timber production without irreversible resource damage to soils productivity or watershed conditions;
- have a reasonable assurance that the area could be restocked after final harvest;

- not be withdrawn from timber production by an Act of Congress, the Secretary of Agriculture, or the Chief of the Forest Service;
- have sufficient timber volume to be currently available for harvest (be in Volume Class 4, 5, 6, or 7); and
- have a LUD that allows commercial timber harvest (LUD III or LUD IV).

Table 3-4 shows the acres of tentatively suitable forested land in the Kelp Bay Planning Area by VCU. Since VCU 295 is classified as LUD II (unavailable for timber harvest), it is not displayed. Also, since there is no identified Volume Class 7 in the Project Area, it is not displayed. This table displays both gross tentatively suitable acres and available tentatively suitable acres. Available tentatively suitable acres are acres remaining after Tongass Timber Reform Act stream buffers and mandatory 330-foot eagle tree buffers have been removed from the base. These buffers are unavailable for timber harvest. Available tentatively suitable acres are the acreages used for comparison purposes.

Table 3-4
Tentatively Suitable Forest Land by Volume Class in Acres

	Volume Class[1]							
	4		5		6		Totals	
VCU	Gross	Available	Gross	Available	Gross	Available	Gross	Available
293	3,722	3,569	1,140	1,068	0	0	4,862	4,637
294	3,653	3,488	2,909	2,706	310	207	6,872	6,401
296	3,304	3,157	2,479	2,383	609	579	6,392	6,119
297	4,445	4,163	2,639	2,279	101	59	7,185	6,501
298	2,142	1,935	1,311	1,202	71	52	3,524	3,189
314	1,278	1,229	1,559	1,456	88	75	2,925	2,760
315	1,267	1,223	2,619	2,477	0	0	3,886	3,700
Totals	19,811	18,764	14,656	13,571	1,179	972	35,646	33,307

SOURCE: Zaborske, 1990.

[1] Volume Classes 1 through 3 (not presented) contain less than 8 MBF/acre; Volume Class 4 contains 8-20 MBF/acre; Volume Class 5 contains 20-30 MBF/acre; Volume Class 6 contains 30-50 MBF/acre; and Volume Class 7 contains 50 or more MBF/acre.

Because a slightly different process was used to identify tentatively suitable forest lands than in the original TLMP process, the total acres of tentatively suitable forest land between the two databases are somewhat different. However, this difference is only 3,152 acres (8.8 percent) over the entire planning area and is considered minor. It could be accounted for by the fact that the original TLMP process used air photo points and the current process used polygon acreages calculated electronically in the GIS system. Because these acreages are so close and the current process can be rapidly reproduced and used in combination with other resource databases in GIS systems, the GIS system will be used in this analysis.

Most of the timber harvested to date in the Kelp Bay Project Area has been from old-growth stands. Occasionally, second-growth stands originating from wind or landslide disturbance are harvested. Table 3-5 provides a summary of the timber acreage previously harvested to date in the Kelp Bay Project Area.

Table 3-5
Acres of Past Timber Harvest by VCU

VCU	Total 1961-1990 Harvest
293	1,409
294	685
295	0
296	953
297	763
298	481
314	99
315	565
Total	4,955

SOURCE: Zaborske, 1990.

Since 1976, regeneration (the process of establishing a new crop of trees on the harvested units) has been certified by a silviculturist in the Tongass National Forest. Regeneration of a harvest unit may be certified when it is adequately stocked with healthy young trees, usually within 3 to 5 years after a stand has been harvested. Kelp Bay Project Area reforestation records contain data on harvest units totaling 4,955 acres. Of this total, 4,452 acres have been reforested by natural seeding, and 503 acres have been hand planted. Over 87 percent of acres previously harvested have been certified as being adequately stocked. The remaining acres have not yet been surveyed for certification. Based upon past successes with natural seeding and hand planting on the Tongass National Forest, it is assumed that all acres are adequately stocked.

In the Kelp Bay Project Area, 1,558 acres have been precommercially thinned by selectively removing trees from second-growth stands that are 15 to 25 years old. Thinning reduces competition among trees in the stand, causing the remaining trees to grow faster and larger. Precommercial thinning also benefits other resources such as wildlife by allowing more light to reach the forest floor, increasing understory production.

Plant Series

The natural vegetation of the Kelp Bay Project Area is a mosaic of coniferous forest interspersed with alpine tundra, muskeg (bog), shrubland, estuarine, and beach fringe plant communities. Permanent ice, rock, and persistent snow pack in many areas provide a striking contrast to the diverse vegetation. Forest and non-forest plant communities are discussed below.

Vegetation in the Kelp Bay Project Area has been classified into plant associations that are based upon the climax plant community. The climax plant community is the result of the interaction between landform, climate, and soils. All plant associations having the same climax tree(s) are referred to as a series and are named based upon the climax tree(s). The Kelp Bay Project Area has five plant series (Table 3-6). The following series descriptions are based upon Martin (1989).

Sitka Spruce Series

Plant associations in this series are generally associated with riparian areas and other disturbed sites such as stringers between avalanche chutes. This series occurs predominately on warmer sites at lower elevations. Sitka spruce is the dominate overstory tree species, but western hemlock can be a co-dominant. Other tree species (mountain hemlock, Alaska cedar, and shore pine) rarely occur. Dominant shrub species include alder, devil's club, and blueberry. Salmonberry occurs to a lesser degree. Ferns and skunk cabbage are the dominant herbs. The Sitka spruce series is generally highly productive, and the heights of mature spruce often exceed 125 feet.

Western Hemlock Series

Typical old-growth forest stand of prime Sitka spruce, which generally occurs on warmer sites at lower elevations.

Plant associations in this series generally occur in the uplands on mountains, hills, and footslopes with moderate to well-drained soils. The predominate overstory tree species is the western hemlock, but Sitka spruce does occur in the overstory as a minor component. The shrub layer is dominated by blueberry and rusty menziesia; however, devil's club can be a major component in some areas. Bunchberry and five-leaf bramble dominate the herb layer, but skunk cabbage can be a major component in areas with seasonally wet soils. Plant productivity is generally high with mature hemlock often exceeding heights of 100 feet.

Mountain Hemlock Series

These plant associations are generally found on cold high elevation sites above the western hemlock series. Mountain hemlock is the dominant overstory tree species with Sitka spruce and Alaska cedar occurring to a lesser degree. The shrub layer is dominated by blueberry. Copperbrush and cassiope also occur. Deer cabbage is the dominant herb. Plant productivity is limited by the shorter growing season at high elevations and by reduced soil drainage common to some of the associations.

Mixed Conifer Series

These plant associations generally occur in the uplands often near muskegs. Dominant overstory tree species are mountain hemlock, western hemlock and Alaska cedar. Sitka spruce and shore pine can occur but are minor components where present. Blueberry and rusty menzesia are the dominant shrub species. Dominant herbs vary and include skunk cabbage, five-leaf bramble, deer cabbage and ferns. Plant productivity is primarily limited by poor soil drainage.

Western Hemlock/Alaska Cedar Series

These plant associations generally occur on mountains and hill slopes. Dominant overstory tree species are western hemlock and Alaska cedar. Other tree species are incidental. Blueberry is the dominant shrub with rusty menziesia occurring to a lesser degree. Dominant herbs vary and include ferns, bunchberry dogwood, skunk cabbage and five-leaf bramble. Plant productivity is limited by shallow soils and/or poor drainage.

Table 3-6 displays the approximate percent of area occupied by each plant series found in the Kelp Bay Planning Area. Values are broken down by VCU. The western hemlock/Alaska cedar series is not displayed because this series has very limited extent in the Kelp Bay Project Area and usually occurs as an inclusion with the western hemlock and mixed conifer series.

Table 3-6
Percent of Project Area Occupied by Major Forest Plant Series by VCU

VCU	Spruce	Western Hemlock	Mountain Hemlock	Mixed Conifer	Non-Forest
293	0	41	4	11	44
294	3	31	5	4	57
295	7	29	3	1	60
296	3	48	7	5	37
297	1	48	7	18	17
298	1	18	3	1	77
314	2	12	2	1	83
315	3	56	2	10	29
Percent of Total	2	30	4	5	59

SOURCE: Zaborske, 1990.

Non-Forest Plant Communities

Various non-forest plant communities occur near estuaries, in riparian areas, muskegs, alpine meadows, and alpine lichen rock outcrops in the Kelp Bay Project Area. The approximate percentage distributions by VCU are displayed in Table 3-7.

Estuary tidal flats are inundated by high tides. Vegetation consists primarily of sedges, red fescue, and sea milkwort. Bluejoint and sedges dominate on low terraces, which are rarely inundated by tides but have high water tables.

Shrub riparian areas are found on active floodplains and are frequently disturbed. Soils are generally deep and well-drained. Salmonberry, stink currant, devil's club and ferns are the dominant vegetation. Willow and cottonwood are also found in floodplains. These willow and cottonwood plant communities do not occupy a large area but are unique to the islands on the Chatham Area.

Muskegs are dominated by sphagnum moss and sedges. Trees and shrubs are rare. The water table is at the surface and numerous small ponds are scattered throughout the muskegs.

Table 3-7

Percent of Area Occupied by Non-Forest Plant Communities by VCU

VCU	Estuary Tidal Flats	Shrub Riparian	Muskeg	Meadows	Alpine-Lichen Rock Outcrops	Total
293	4	6	9	22	3	44
294	1	13	3	30	10	57
295	1	21	1	28	9	60
296	2	9	2	20	4	37
297	2	1	1	13	0	17
298	1	16	1	38	21	77
314	1	21	1	27	33	83
315	1	6	7	14	1	29
Percent of Total	1	13	3	27	15	59

SOURCE: Zaborske, 1990.

Alpine meadows are dominated by cassiope and mixed forbes including mountain heather. These meadows are found on steep, well-drained rock outcrops at high elevations.

Alpine lichen rock outcrops are found at high elevations above timberline. Plant cover does not exceed 50 percent. Species diversity is high and includes cassiope, clubmoss, and grass species.

Threatened or Endangered Plant Species

No plant species known to occur in Southeast Alaska has been determined to be threatened or endangered by the U.S. Fish and Wildlife Service.

Floodplains

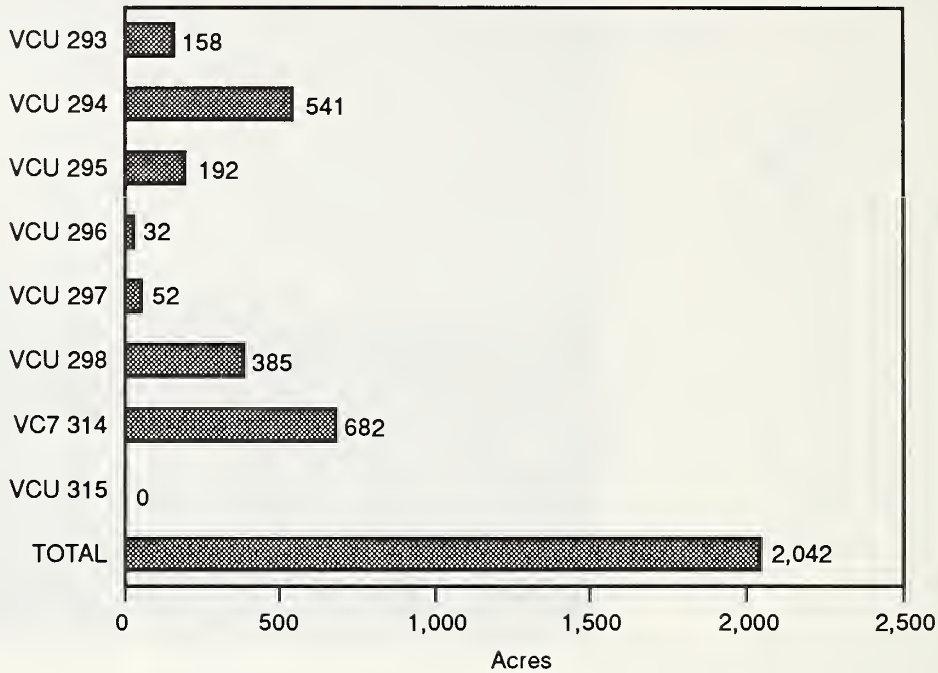
Floodplains are usually built of naturally eroded sediments carried by the stream or river and deposited in slack water sections of channels during high water periods. Floodplains are defined as areas subject to a 1 percent (100-year recurrence) or greater chance of flooding in any given year. Nutrient-rich sediments underlain by coarse-textured sediments make floodplains the most productive lowland timber, wildlife, and fisheries resource sites on the national forest.

Alpine pond surrounded by Muskeg on Catherine Island. Muskeg such as this occupy only 3 percent of the total Project Area while freshwater ponds and lakes occupy about 2 percent.

The floodplains on the national forest are typically found in broad, flat, alluvial U-shaped valleys. They are forested and usually support plant communities having an overstory of Sitka spruce or Sitka spruce and western hemlock. The shrub understory is variable and includes blueberry, skunk cabbage, devil's club, salmonberry, and alders. The herb understory is dominated by ferns and broadleaf plants of varying species. Supporting this vegetation are well, moderately well, or somewhat poorly drained deep mineral soils with thin organic surface layers.

The potential flooding sites in the Kelp Bay Project Area are the varying width floodplains and terraces of U-shaped valley bottoms. However, flooding may occur in a diversity of land types including steep, narrow mountain canyons; wide, flat alluvial valleys; lake shores; coastal areas; and alluvial fans. To date, no flood hazard or flood insurance studies have been conducted in the Project Area. Soils and landform inventory data are the only available information for making initial determinations of the location and approximate boundaries of floodplain areas. There are 2,042 acres of floodplains mapped in the Project Area. Figure 3-2 displays the distribution of floodplains by VCU.

Figure 3-2
Acres of Floodplains by VCU



SOURCE: West, 1990.

Wetlands

Executive Order 11990, as amended (42 U.S.C. 4321 et seq.), requires Federal agencies having statutory authority and leadership over Federal lands to avoid the long- and short-term adverse impacts associated with the destruction or modification of wetlands to the extent possible. Where feasible, direct or indirect support of new construction in wetlands must be avoided. Federal agencies are required to preserve and enhance the natural and beneficial values of wetlands in carrying out their responsibility for (1) acquiring, managing, and disposing of lands and facilities; (2) providing federally undertaken, financed, or assisted construction and improvements; and (3) conducting Federal activities and programs affecting land use.

The Army Corps of Engineeers (COE) (Federal Register, 1982) and the Environmental Protection Agency (EPA) (Federal Register, 1980) jointly define wetlands as, "Those areas that are inundated or saturated by surface or groundwater with a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas."

The COE and EPA signed a Memorandum of Agreement that provides clarification and general guidance regarding the level of mitigation necessary to demonstrate compliance with the Clean Water Act in connection with standard Section 404 dredge and fill permits. The President's Domestic Policy Council is charged with developing recommendations regarding the attainment of the goal of no net loss of the Nation's wetlands. The President's Domestic Policy Council will consider the challenges posed in Alaska where a high proportion of developable land is wetlands and where technical difficulties exist regarding opportunities for compensatory mitigation. The Forest Service's objective is to support the President's Domestic Council assignment during project planning. The COE Wetlands Delineation Manual (COE, 1987) provides the standards for determining areas of wetlands and deepwater habitats.

Wetlands function in flood flow moderation, groundwater recharge and discharge, wildlife and fish habitat, and water quality protection. In the national forest, wetlands range from sea level to alpine and include forested sites on poorly and very poorly drained organic and poorly and somewhat poorly drained mineral soils. Open sites of herbaceous plants are found on poorly and very poorly drained organic soils (muskegs). Wetland and non-wetland acres by VCU are shown in Table 3-8.

Table 3-8
Acres of Wetland and Non-Wetland by VCU

VCU	Wetland Acres	Non-Wetland Acres	Total
293	3,446	10,292	13,738
294	2,249	21,591	23,840
295	712	11,538	12,250
296	2,081	13,997	16,078
297	5,985	9,799	15,784
298	1,353	27,071	28,424
314	1,046	34,245	35,291
315	1,662	6,798	8,460
Total	18,534	135,331	153,865

SOURCE: West et al., 1990.

Wildlife

Alaska's wildlife are valuable for aesthetic, economic, recreational, and subsistence reasons. Visitors come from all over the world to view bald eagles, mountain goats, brown bears, and other wildlife species in Southeast Alaska.

Most of the 300 wildlife species that occur in Southeast Alaska exist within the Kelp Bay Project Area and occupy a diverse range of habitats. However, not all the species inhabiting the Kelp Bay Project Area would be affected by the proposed actions or alternatives. There-

fore, to identify effects on wildlife, several types of studies and inventories have been conducted. Wildlife habitats were inventoried and species were selected which were most likely to be adversely affected by timber harvest activities in the Kelp Bay Project Area. Computer models were used to inventory habitat conditions for the Management Indicator Species (MIS).

Management Indicator Species

MIS are species whose population changes are believed to best indicate the effects of land management activities (Forest Service, 1982a). Through the MIS concept, the total number of species occurring within a project area is reduced to a manageable set of species that collectively represent the complex of habitats, species, and associated management concerns. MIS are used to meet the requirements of the National Forest Management Act for maintaining population viability (the ability of a population to sustain itself naturally) and biological diversity.

Eleven wildlife MIS were chosen for the Kelp Bay Project Area:

Brown bear and her cub, one of the 11 wildlife management indicator species chosen for the Kelp Bay Project Area.

- Sitka black-tailed deer
- Mountain goat
- Brown bear
- Red squirrel
- River otter
- Marten
- Brown creeper
- Red-breasted sapsucker
- Hairy woodpecker
- Vancouver Canada goose
- Bald eagle

The Analysis of the Management Situation for the Tongass National Forest (Forest Service, 1990) provides detailed species accounts including literature review, distribution, habitat suitability and capability, human disturbance or mortality factors, and viable populations.

Habitat capability models were developed for the MIS by interagency task groups and are described in Suring et al. (1988). The specific versions of the models that were used and the variables used in the models are identified in Appendix G.

Wildlife Habitats

Habitat is the type of environment in which a species occurs. The environment can be described in physical or biological terms, which often includes elevation, topographic position, or type of vegetative community. A species may occupy a range of different habitats or more than one distinctive kind of habitat in different seasons. Habitats inventoried in the Kelp Bay Project Area include:

- Beach fringe
- Estuary fringe
- Riparian
- Forest
- Old-growth forest
- Alpine/subalpine

These habitats are described in detail below. An acreage inventory (obtained from information stored in the Chatham Area GIS) of each habitat by VCU is included in Table 3-10.

Beach Fringe

Areas within 500 feet of the ocean shoreline are transitional zones between land and water, salt and freshwater, and vegetated and non-vegetated conditions (Forest Service, 1979c). The Kelp Bay Project Area has 157 miles of ocean shoreline. Table 3-9 indicates that approximately 7,903 acres of beach fringe habitat exists in the Kelp Bay Project Area. Forested areas in this transitional zone are heavily used by species with high economic, recreational, subsistence, or aesthetic values. Brown bear, river otter, bald eagle, pine marten, black-tailed deer, and Vancouver Canada geese concentrate their activities during some seasons in these forest stands. Many of these species exhibit a preference for or dependence on old-growth forest stands. Old-growth dominates and is 80 percent of the total beach fringe. Table 3-10 displays the current makeup of the beach fringe.

Estuary Fringe

Bears, waterfowl, furbearers, and bald eagles are primary users of the estuary fringe habitat. Estuary fringe habitat is a 1,000-foot zone around estuary areas identified to quantify alteration of habitat. The estuary fringe is similar to beach fringe, but because of species diversity, it has a greater value to wildlife, especially brown bears, river otters, bald eagles, and waterfowl. Table 3-9 indicates approximately 6,217 acres of estuary fringe habitat exists in the Kelp Bay Project Area. Table 3-10 indicates that 60 percent of the estuary fringe is old growth and 19 percent is in an early successional/understory colonization stage.

Riparian

Riparian habitat is recognized as some of the most diverse and productive habitat in Southeast Alaska. It occurs along streamcourses or around inland lakes and is extremely important for eagles, furbearers, and brown bears (Forest Service, 1986b). The Kelp Bay Project Area has approximately 340 miles of stream channels and 745 acres of freshwater lakes and ponds. The occurrence of riparian soils and vegetation was used to inventory this habitat type. Table 3-9 indicates approximately 9,328 acres of riparian habitat exists in the Kelp Bay Project Area.

Table 3-9
Wildlife Habitats in the Kelp Bay Planning Area, 1990

	Beach Fringe	Estuary Fringe	Old-Growth	Forested	Alpine & Sub-Alpine	Riparian
VCU	Total Acres	Total Acres	Total Acres	Total Acres	Total Acres	Total Acres
293	748	1,264	5,643	11,643	2,949	621
294	866	686	8,723	16,357	9,149	1,609
295	200	332	4,384	9,024	2,572	706
296	1,564	1,283	7,598	13,702	2,253	1,006
297	1,309	769	8,336	15,164	107	1,189
298	906	491	5,902	13,690	13,573	2,055
314	779	560	4,659	10,018	11,656	1,887
315	1,531	832	4,947	7,756	424	255
Total	7,903	6,217	50,192	97,354	42,683	9,328

SOURCE: Weber, 1990.
Notes: Habitats overlap, so the totals for each habitat type cannot be added to reflect the total acres in the Kelp Bay Project Area. Riparian acres reflect the area of riparian soil and vegetation and do not match acres in the *Soils* section of this chapter.

Bears, waterfowl, furbearers, and bald eagles are the primary users of estuary fringe, such as the area around this estuary located in the Middle Arm of Kelp Bay.

Table 3-10
Vegetative Conditions of Selected Wildlife Habitats, 1990 (by acres)

Habitat Type	Non-Forested	Under-story Colini-zation Stage	Under-story Exclu-sion Stage	Under-story Reiniti--ation Stage	Old-Growth	Other Forest Cover	Total
Beach Fringe	436	534	20	234	6,318	361	7,903
Estuary Fringe	775	1,158	19	192	3,728	345	6,217
Alpine/ Subalpine	29,095	6	0	0	1,177	12,405	42,683
Total	56,511	5,459	63	596	50,192	41,044	153,120
Percent of Total Project Area	37	3	<1	<1	33	27	

SOURCE: Weber, 1990.
Note: There are 153,865 total acres in the Kelp Bay Project Area; 153,120 acres are land and 745 acres are freshwater.

Forest

Forest habitat includes all areas with forest cover. The other habitats discussed above occur partially or entirely within the forested habitat. Many wildlife species, including those dependent on old-growth stands, use all forested areas within the Kelp Bay Project Area. While the other habitats have been delineated because of specific attributes or management concerns, the forested habitat is presented to disclose general overall effects of management activities. Table 3-9 indicates approximately 97,354 acres of forested habitat exists in the Kelp Bay Project Area.

Old-growth Forest

Much of the forest in the Kelp Bay Project Area can be considered old growth because it has been largely unaffected by timber harvest, windthrow or fires. Old-growth forest is characterized as stands of trees usually well past the age of maturity with declining growth rates and signs of decadence, such as dead and dying trees, snags, and downed woody material. The stand usually includes large diameter trees, multi-layered canopies, a range of tree diameter sizes, and the notable presence of understory vegetation. These forests are in a dynamic, steady-state where the death of old trees is balanced by the growth of new trees. Table 3-9 indicates approximately 50,192 acres of old-growth exists in the Kelp Bay Project Area, and includes acres that may occur in the beach fringe, estuary fringe, or other of the habitat areas. Old-growth represents 52 percent of the total forested area in the Project Area.

Alpine/Subalpine

Alpine/subalpine habitat is the upland area over 1,500 feet in elevation. It consists largely of alpine meadows, rock, slides, and unproductive forest or shrub cover and is seasonally important to mountain goats, bear, and deer. Table 3-9 indicates approximately 42,683 acres of alpine/subalpine habitat exists in the Project Area, and Table 3-10 shows that 29,095 acres (68 percent) of the total is non-forested.

Figure 3-3 shows the relationship between the MIS and the different habitats.

Threatened, Endangered, and Sensitive Wildlife Species

The humpbacked whale has been on the U. S. Endangered Species list since 1970 and has been seen in the waters of Kelp Bay as well as in Peril and Chatham Straits. There are no critical habitats designated or considered in the Kelp Bay Project Area (Pennoyer, 1990).

The Steller sea lion was designated threatened on April 5, 1990, and a sea lion haulout is located at the southern tip of Catherine Island. During the winter months, about 100 animals have been consistently noted by ADF&G personnel (Pennoyer, 1990). No critical habitats have been designated in the Kelp Bay Project Area at this time (Pennoyer, 1990).

The American peregrine falcon may occur in the Kelp Bay Project Area as a migrant and the marbled murrelet is being considered for listing and has been documented as occurring in the Project Area (Holmberg, 1990).

No other threatened, endangered, sensitive, or proposed species are known to occur in the Project Area. The bald eagle is endangered in the lower 48 states but not in Alaska. See Appendix F for documentation of Section 7 consultation. Biological assessments will be prepared and included in the Final EIS.

Figure 3-3
Principal Habitats Used by Management Indicator Species

SPECIES	Beach Fringe	Estuary Fringe	Riparian	Old-Growth	Alpine/Subalpine
Sitka Blacktailed Deer	●			●	●
Mountain Goat				●	●
Brown Bear	●	●	●	●	●
Red Squirrel				●	
Otter	●	●	●	●	
Marten	●	●	●	●	
Brown Creeper				●	
Red-Breasted Sapsucker				●	
Hairy Woodpecker				●	
Vancouver Canada Goose	●	●	●	●	
Bald Eagle	●	●	●	●	

(Column group heading: HABITATS)

SOURCE: Weber, 1990.

Habitat Capability for the MIS

Habitat capability models are used to assist in the evaluation of effects of proposed land management activities on wildlife habitats and populations. The development of a species model involves extensive biological and literature research. An interagency task force of biologists from the Alaska Department of Fish and Game, U.S. Forest Service, and U.S. Fish and Wildlife Service developed the models. Verification of the models has not been completed, but they are the best available tool for evaluating effects of management activities. These models are used as a tool for management decisions and should be recognized as only one source in the overall process to identify specific project effects. Knowledge concerning each species and its various habitat needs improves through time and adds to the reliability of modeling predictions.

The objective of each model is to estimate the capability of habitats to support populations of the selected indicator species. Each model provides an estimation of a habitat suitability index and associated population-carrying capacity for each physical and biological condition in the Kelp Bay Project Area. The models are used to compare the effects of proposed management alternatives on the potential habitat capability of each MIS. Data collection on factors such as snow conditions, timber volume classes, physiographic features, and predation provide the values used to evaluate habitat capability. Specific variables used in the models is shown in Appendix G. The information obtained from the models is provided below under the respective indicator species.

Sitka black-tailed deer range through all major habitats in the APC contract area.

Sitka Black-tailed Deer

The Sitka black-tailed deer ranges through all major habitats in the APC contract area. They represent species using lower elevation old-growth forest habitats during the winter because winter is recognized as the limiting habitat factor for deer and numerous other species in Southeast Alaska.

Deer rely heavily on forested habitats for cover, and much of their feeding is in forested areas. In summer, these deer range through all elevations, including alpine meadows and subalpine forests. They also feed in clearcuts where forage is plentiful. Winter snows drive them to lower elevations, and deep snow forces them to the beach fringe (Forest Service 1986b). They may even feed on seaweed at low tide when most of their preferred browse is unavailable.

Results of the deer model indicate winter range in the Kelp Bay Project Area is capable of supporting 2,446 deer (Table 3-11). This represents a 16 percent reduction in habitat capability since the start of the APC contract in 1961 because of timber harvest. Table 3-11 shows habitat capability by VCU at current conditions and before 1961.

Table 3-11
Projected Wildlife Populations by VCU Based on Habitat Capability Models

	VCU 293			VCU 294		
Species	1961	1990	Percent Change	1961	1990	Percent Change
Sitka Black-tailed Deer	482	330	-32	545	470	-14
Mountain Goat	2	2	-0	12	12	-0
Brown Bear	20	18	-10	34	34	-0
Red Squirrel	10,084	8,680	-14	14,037	13,411	-4
Otter	13	9	-31	16	12	-25
Marten	34	27	-21	42	39	-7
Brown Creeper	229	19	-92	204	101	-50
Red-breasted Sapsucker	1,368	1,192	-13	1,781	1,694	-5
Hairy Woodpecker	149	79	-47	196	162	-17
Vancouver Canada Goose	36	36	-0	35	35	-0
Bald Eagle	39	24	-38	51	38	-25

SOURCE: Weber, 1990.

Table 3-11
Projected Wildlife Populations (continued)

Percent Species	VCU 295 1961	1990	Percent Change	VCU 296 1961	1990	Change
Sitka Black-tailed Deer	262	262	0	354	290	-18
Mountain Goat	3	3	0	2	2	-0
Brown Bear	18	18	0	24	23	-4
Red Squirrel	7,134	7,134	0	12,776	11,829	-7
Otter	11	11	0	21	17	-19
Marten	21	21	0	42	38	-10
Brown Creeper	86	86	0	284	142	-50
Red-breasted Sapsucker	877	877	0	1,617	1,498	-7
Hairy Woodpecker	89	89	0	206	159	-23
Vancouver Canada Goose	15	15	0	35	35	-0
Bald Eagle	34	34	0	69	55	-20

SOURCE: Weber, 1990.

Table 3-11
Projected Wildlife Populations (continued)

Species	VCU 297 1961	1990	Percent Change	VCU 298 1961	1990	Percent Change
Sitka Black-tailed Deer	611	529	-13	229	193	-16
Mountain Goat	0	0	-0	15	15	-0
Brown Bear	23	22	-4	38	37	-3
Red Squirrel	13,424	12,681	-6	10,817	10,503	-3
Otter	17	15	-12	13	12	-8
Marten	46	43	-7	30	27	-10
Brown Creeper	178	64	-64	110	39	-65
Red-breasted Sapsucker	1,811	1,716	-5	1,332	1,272	-5
Hairy Woodpecker	186	148	-20	121	97	-20
Vancouver Canada Goose	49	49	-0	24	24	-0
Bald Eagle	55	48	-13	42	40	-5

SOURCE: Weber, 1990.

Table 3-11
Projected Wildlife Populations (continued)

Species	VCU 314 1961	VCU 314 1990	Percent Change	VCU 315 1961	VCU 315 1990	Percent Change
Sitka Black-tailed Deer	186	179	-4	232	193	-17
Mountain Goat	48	48	-0	6	6	-0
Brown Bear	45	45	-0	13	12	-8
Red Squirrel	7,992	7,934	-1	7,554	7,083	-6
Otter	12	12	-0	17	15	-12
Marten	24	23	-4	29	26	-10
Brown Creeper	61	47	-23	135	48	-64
Red-breasted Sapsucker	955	943	-1	1,018	945	-7
Hairy Woodpecker	98	93	-5	143	114	-20
Vancouver Canada Goose	17	17	-0	20	20	-0
Bald Eagle	38	38	-0	54	47	-13

SOURCE: Weber, 1990.

Table 3-11
Projected Wildlife Populations (continued)

Species	Total of All VCUs 1961	Total of All VCUs 1990	Percent Change
Sitka Black-tailed Deer	2,900	2,446	-16
Mountain Goat	89	89	-0
Brown Bear	214	209	-3
Red Squirrel	83,818	79,255	-5
Otter	119	103	-13
Marten	267	244	-9
Brown Creeper	1,287	546	-58
Red-breasted Sapsucker	10,758	10,137	-6
Hairy Woodpecker	1,189	941	-21
Vancouver Canada Goose	231	231	-0
Bald Eagle	382	324	-15

SOURCE: Weber, 1990.

Mountain Goat

Mountain goats represent species using cliffs, alpine and subalpine, and old-growth forest habitats. They occur in the more rugged, inaccessible reaches of the Kelp Bay Project Area. The quantity and quality of winter habitat is the most limiting factor for mountain goats in Southeast Alaska. Heavy snow drives them to lower elevation subalpine old-growth stands during the winter where they are most likely to be affected by forest management activities. The mountain goat winter habitat capability model uses the presence of cliffs, distance from cliffs, location, aspect, and vegetation to evaluate habitat. The model indicates there is suitable habitat for mountain goats in the Kelp Bay Project Area capable of supporting 89 goats (Table 3-11). Habitat capability did not change from 1961 to 1990.

Brown Bear

Brown bear occupy sea-level to alpine habitats and require large areas of habitat and protection from human disturbance. Bear distribution corresponds closely to the seasonal abundance and quality of food. In Southeast Alaska, old-growth forest is used extensively throughout the year by brown bears for foraging, cover, and denning.

The late summer season has been identified as the most critical or limiting period for brown bear (Schoen et al., 1989). During this season, bears concentrate along low-elevation valley bottoms and coastal salmon streams. These are the same areas of highest human use and most intense resource development activities. The brown bear model evaluates the habitat capability during this critical late summer season. Variables in the model include location, vegetation, and fish abundance. The model indicates the habitat is capable of supporting 209 bears in the Project Area during the critical late summer season (Table 3-11). This is a 2 percent decline since 1961.

Red Squirrel

Optimum habitat for red squirrels provides opportunities for food sources, food caching sites, and nesting cover (Vahle and Patton, 1983). This includes forested stands with two or more species of conifers of cone-bearing age for food, snags for den sites, and downed logs for cache sites. These conditions are best provided in old-growth Sitka spruce forests in Southeast Alaska. Other forest types provide the life requirements of red squirrels, but food resources are not as plentiful as they are in spruce forests. Red squirrels represent a species that can survive fairly well in second-growth timber stands at seed-producing age.
The squirrel model evaluates habitat capability based on elevation and vegetation. In the Kelp Bay Project Area, the model indicates there is suitable habitat capable of supporting 79,255 red squirrels (Table 3-11). This is a 5 percent decline in habitat capability since 1961.

River Otter

River otters are associated with both coastal and freshwater aquatic environments and the immediately adjacent upland habitats. Habitat selection is also a product of food availability. Food items include fish, abalone, sea urchins, chitons, crabs, and other marine invertebrates; however, fish are generally the main food source. Specific data on otter food availability along the coast does not exist. Therefore, cover attributes are the only habitat parameter available for measuring habitat quantity and quality. The otter model evaluates habitat capability during the spring based on location, vegetation, general fish abundance, and lake size.

Season and habitat factors most limiting to river otters have not been identified. Until more knowledge is obtained on what factors limit the river otter in Southeast Alaska, the current model is considered the best tool for evaluating the effects of forest management activities. The model indicates the habitat for river otter in the Kelp Bay Project Area is capable of supporting 103 otter (Table 3-11). This is a 13 percent decline in capability from 1961.

Marten

Martens are animals that inhabit old-growth forests, including beach fringe and riparian areas. The value of habitat is based upon occurrence and availability of foods, and cover characteristics. The quantity and quality of winter habitat is the most limiting factor for marten in Southeast Alaska. Marten are also representative of other species using lower elevation old-growth forest habitats during the winter.

The marten model evaluates the habitat capability for marten during the critical winter season based on location and vegetation. The marten model indicates there is habitat capable of supporting 244 marten in the Kelp Bay Project Area (Table 3-11). This is a 9 percent decline from 1961 habitat capability.

Marten are representative of fur-bearing species inhabiting old-growth forests, beach fringe, and riparian areas.

Brown Creeper

The brown creeper is an uncommon permanent resident throughout Southeast Alaska and is associated with large, old-growth trees. This species is most dependent on high volume old growth where tree size is more important than species. Large diameter trees produce more beetle larvae per unit of surface area and facilitate feeding efficiency by brown creepers (Raphael and White, 1984; Airola and Barrett, 1985; Parker and Stevens, 1979)

Winter habitat has been suggested as the limiting factor for cavity-nesting birds including brown creeper (Raphael and White, 1984; Haapanen, 1965). The brown creeper model evaluates the capability of winter habitat based on vegetation and elevation. The model indicates there is suitable winter habitat in the Project Area capable of supporting 546 brown creepers. This represents a 58 percent decline in habitat capability.

Red-breasted Sapsucker

Red-breasted sapsuckers are summer residents that require old-growth forest habitats with snags. They are primary excavators because they excavate cavities for other cavity-using wildlife species and for this reason are considered a keystone species in Southeast Alaska (Sidle and Suring, 1986). The quantity of snags determines whether red-breasted sapsuckers will use an area. Although there is not a forest-wide inventory of snags, research and timber-stand exams in Southeast Alaska identified which forest types and successional stages provide the most favorable nesting habitat.

The red-breasted sapsucker model evaluates breeding habitat capability based on vegetation and elevation. The model indicates there is suitable habitat in the Project Area capable of supporting 10,137 red-breasted sapsuckers (Table 3-11). This is a 6 percent decline in habitat capability.

Hairy Woodpecker

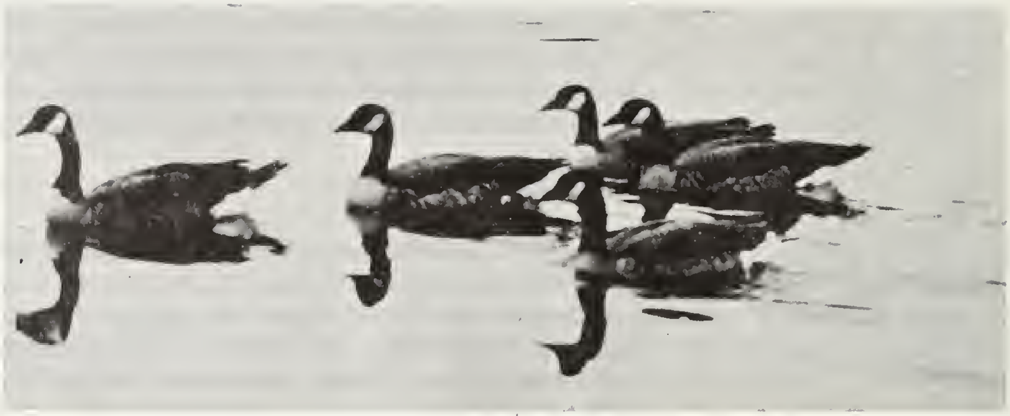
The hairy woodpecker is an uncommon, permanent resident throughout Southeast Alaska requiring old-growth forest habitats with snags. Like the red-breasted sapsucker, it is a primary excavator. Snag quantity has a direct relationship to potential of an area to support hairy woodpeckers. The forest types and successional stages that are most favorable for nesting habitat have been identified through research and stand examinations in Southeast Alaska.

Winter roosting and foraging habitat are thought to be the limiting factor for resident cavity-nesting birds (Raphael and White, 1984; Haapanen, 1965). The hairy woodpecker model evaluates winter habitat capability based on vegetation and elevation. The model indicates there is suitable winter habitat in the Kelp Bay Project Area capable of supporting 941 hairy woodpeckers (Table 3-11). This is a 21 percent decline in hairy woodpecker habitat capability.

Vancouver Canada Goose

Vancouver Canada geese, a year-round resident waterfowl species, use wetlands (both forested and non-forested) in the estuary, riparian, and upland areas of the forest. They are unique among all subspecies of Canada geese in that they use forested habitat for nesting and brood rearing (Lebeda and Ratti, 1983). Knowledge of year-round goose habitat requirements is very limited. Hanson (1962) indicated that nesting and brood rearing is probably the most limiting habitat factor. For this reason and the potential for effects from forest management activities, the goose model evaluates nesting and brood rearing habitat capability based on vegetation and location. The model indicates there is suitable habitat in the Kelp Bay Project Area capable of supporting 232 Canada geese (Table 3-11). Habitat capability has not declined due to management activities since 1961.

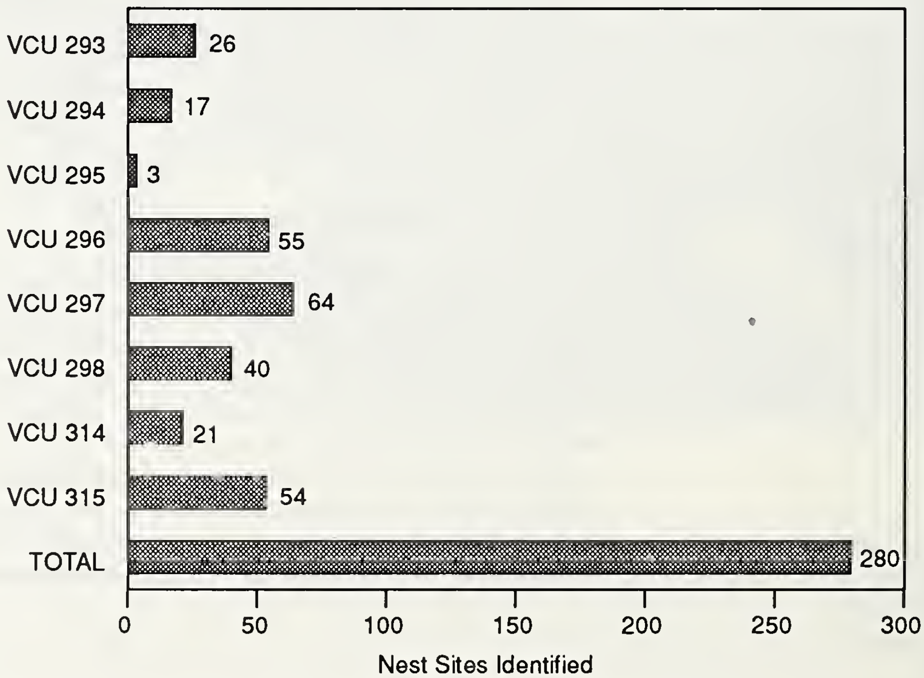
Vancouver Canada goose habitat capability is assumed to reflect potential abundance of many species of waterfowl within the Project Area.



Bald Eagle

Bald eagles are found throughout Southeast Alaska and are primarily associated with coastal habitats and inland riparian habitats. Bald eagles may also concentrate at feeding grounds in the spring. Throughout their range, bald eagles are opportunistic in their use of available food resources. Fish is the dietary mainstay in Southeast Alaska (Kalmbach et al., 1964). Typical nesting habitat occurs along the coastline in old-growth forests. The majority of nest sites are in Sitka spruce trees. The U.S. Fish and Wildlife Service has identified 280 nest sites in the Kelp B&ay Project Area. Figure 3-4 shows the number of inventoried eagle nest trees by VCU for the Project Area.

Figure 3-4
Bald Eagle Nest Sites by VCU



SOURCE: U.S. Fish and Wildlife Service.

Most of the data collected in Southeast Alaska has been on nesting habitat. The bald eagle model evaluates nesting habitat capability based on location, elevation, stream class, lake size, and vegetation. The model indicates there is suitable nesting habitat capable of supporting 324 eagles (Table 3-11). This is a 15 percent decline in habitat capability since 1961. The current density of inventoried nest sites is 1.9 nests per mile of shoreline.

Consumptive Use of Wildlife

Many of the wildlife species in the Tongass National Forest are important for subsistence and sport hunting. An overview of the consumptive use of wildlife resources in the Kelp Bay Project Area is presented below.

The Project Area lies within three Wildlife Analysis Areas (WAAs) delineated by the State of Alaska to analyze harvest, population and habitat data for wildlife planning and management. WAAs 3313, 3315, and 3731 include all of the Project Area and four VCUs outside of the Project Area. The WAAs lie within Game Management Unit 4 which is a much larger area that includes all of Baranof, Chichagof, Kruzof, and Admiralty Islands. The larger Game Management Units are delineated by the State for regulatory purposes.

Tables 3-12, 3-13, 3-14, 3-15, and 3-16 display harvest data for the three WAAs 3313, 3315 and 3731 for deer, mountain goats, brown bear, river otter, and marten. Use of WAA 3731 was heavier for mountain goat, brown bear, and deer hunting than the other two WAAs (Tables 3-12, 3-13, and 3-14). Trapping for river otter and marten were heaviest in WAA 3313 (Table 3-15 and 3-16). In 1987, only approximately 4 percent of the total deer harvest, 3 percent of the mountain goat harvest, and 8 percent of the brown bear harvest in Game Management Unit 4 came from these three WAAs. In 1988, WAAs 3313, 3315, and 3731 accounted for 5 percent of the deer harvest, 5 percent of the mountain goat harvest, and 8 percent of the brown bear harvest in Unit 4 (ADF&G Harvest Data).

Table 3-12
Deer Harvest Data by Wildlife Analysis Areas[1]

	Deer Harvested			
	WAA 3313	WA 3315	WAA 3731	Total
1987	217	218	131	566
1988	125	184	440	749
1989	187	216	108	511
Total	529	618	679	1,826

SOURCE: ADF&G harvest data.

[1] WAA 3313 corresponds to VCUs 291, 292, 293 and 294. WAA 3315 corresponds to VCUs 295, 296 and 297. WAA 3731 corresponds to VCUs 298, 314, 315, 316 and 317.

The ability of wildlife resources in the Kelp Bay Project Area to meet the needs of hunters and trappers depends on habitat capable of supporting population levels at sufficiently high levels. As habitat capability declines, potential harvest numbers decline. Current demand is assumed to be the level of harvest reported in ADF&G 1989 hunter survey data.

Table 3-13
Mountain Goat Harvest Data by Wildlife Analysis Areas[1]

	Mountain Goat Harvested			
Year	WAA 3313	WAA 3315	WAA 3731	Total
1980	0	2	2	4
1981	0	2	7	9
1982	1	4	5	10
1983	0	1	7	8
1984	5	1	1	7
1985	0	1	1	2
1986	1	0	0	1
1987	0	1	0	1
1988	0	0	2	2
1989	0	0	0	0
Total	7	12	25	44

SOURCE: ADF&G Harvest Data.

[1] WAA 3313 corresponds to VCUs 291, 292, 293 and 294. WAA 3315 corresponds to VCUs 295, 296 and 297. WAA 3731 corresponds to VCUs 298, 314, 315, 316 and 317.

Table 3-14
Brown Bear Harvest Data by Wildlife Analysis Areas[1]

	Bear Harvested			
Year	WAA 3313	WAA 3315	WAA 3731	Total
1980	3	1	3	7
1981	0	0	4	4
1982	0	0	1	1
1983	3	0	2	5
1984	6	2	3	11
1985	3	3	7	13
1986	2	1	2	5
1987	3	2	4	9
1988	3	1	5	9
1989	2	2	4	8
Total	25	12	35	72

SOURCE: ADF&G Harvest Data.

[1] WAA 3313 corresponds to VCUs 291, 292, 293, and 294. WAA 3315 corresponds to VCUs 295, 296 and 297. WAA 3731 corresponds to VCUs 298, 314, 315, 316 and 317.

Table 3-15

River Otter Harvest Data by Wildlife Analysis Areas[1]

Year	Otter Harvested WAA 3313	WAA 3315	WAA 3731	Total
1980	0	6	0	6
1981	1	4	0	5
1982	1	0	0	1
1983	15	3	0	18
1984	1	6	17	24
1985	10	2	4	16
1986	0	2	0	2
1987	2	0	2	4
1988	6	0	0	6
1989	6	1	0	7
Total	42	24	23	89

SOURCE: ADF&G Harvest Data.

[1] WAA 3313 corresponds to VCUs 291, 292, 293 and 294. WAA 3315 corresponds to VCUs 295, 296 and 297. WAA 3731 corresponds to VCUs 298, 314, 315, 316 and 317.

Table 3-16

Marten Harvest Data by Wildlife Analysis Areas[1]

Year	Marten Harvested WAA 3313	WAA 3315	WAA 3731	Total
1985	9	11	0	20
1986	54	6	0	60
1987	2	0	36	38
1988	24	10	0	34
1989	0	0	0	0
Total	89	27	36	152

SOURCE: ADF&G Harvest Data.

[1] WAA 3313 corresponds to VCUs 291, 292, 293 and 294. WAA 3315 corresponds to VCUs 295, 296 and 297. WAA 3731 corresponds to VCUs 298, 314, 315, 316 and 317.

Tables 3-17 and 3-18 show the demand for the two principal hunted species in the Project Area, the population necessary to support that demand, and the relationship to habitat capability. Habitat capability for demand analysis is assumed to be an approximation of populations.

Habitat capabilities for Sitka black-tailed deer do not appear high enough to support the current demand. There is a significant possibility that habitat capabilities even before 1961 were not sufficient to support current harvest levels. Although habitat capability information is only available for the VCUs in the Project Area, other VCUs in WAAs 3313 and 3731 probably would not be able to support enough deer to meet current demand. The implication is that a severe winter may result in the deer population dropping because there is not enough deer winter range to sustain the current population. This is a natural phenomenon in Southeast Alaska not necessarily tied to levels of timber harvest and would appear unavoidable in the Kelp Bay Project Area.

Habitat capabilities for brown bear appear high enough in the Project Area alone to support current demand. Habitat capabilities in VCUs outside the Project Area but within the WAAs for which the harvest data is compiled will provide additional population support. How much is not currently known. The influence of roads or developments could greatly alter capabilities for brown bear as well as marten (Weber, 1991).

Habitat capabilities for marten and otter appear high enough to support current levels of harvest (Weber, 1991).

Table 3-17
Habitat Capability Compared to Demand for Sitka Black-Tailed Deer

WAA	1989 Harvest	Population Needed to Support Harvest	VCU	1991 Hab Cap
3313	187	1,870	291	*
			292	*
			293	330
			294	470
Subtotal				800
3315	216	2,160	295	262
			296	290
			297	529
Subtotal				1,081
3731	108	1,080	298	193
			314	179
			315	193
			316	*
			317	*
Subtotal				565
Total	511	5,110		2,446

SOURCE: ADF&G Harvest Data; and Deer Habitat Capability Model.
Note: Population needed assumes a 10 percent harvest of the population.
*These VCUs are outside the Project Area, and habitat capability information is not currently available.

Table 3-18
Habitat Capability Compared to Demand for Brown Bear

WAA	1989 Harvest	Population Needed to Support Harvest	VCU	1991 Hab Cap
3313	2	40	291	*
			292	*
			293	18
			294	34
Subtotal				52
3315	2	40	295	18
			296	23
			297	22
Subtotal				63
3731	4	80	298	37
			314	45
			315	12
			316	*
			317	*
Subtotal				94
Total	8	160		209

SOURCE: ADF&G Harvest Data; Brown Bear Habitat Capability Model.
Note: Population requirement assumes a 5 percent harvest of the population.
*These VCUs are outside the Project Area, and habitat capability information is not currently available.

Biological Diversity

The Kelp Bay Project Area represents a diverse, relatively natural environment. The combination of freshwater, marine, and terrestrial systems combined with the complex physical and biological components result in great biological diversity.

The Project Area has a diversity of soil types, vegetation, and wildlife. Table 3-4 and 3-5 in the *Vegetation* section of this chapter display the distribution and relative abundance of the five plant series and six non-forest plant communities that occur in the Project Area. The types and distribution of vegetation are greatly influenced by the 19 different landforms and 113 soil mapping units in the Project Area (West et al., 1990). These landforms and soil mapping units represent a broad array of soil types, landscape positions, and soil development processes.

Successionally, the Project Area is dominated by old-growth, but three other distinct successional stages are also represented. Table 3-10 in the *Wildlife Habitat* section of this chapter shows the distribution and relative abundance of successional stages in some of the wildlife habitats.

Most of the 300 species of birds, fish, and mammals that occur on the Tongass National Forest probably reside in or use the Kelp Bay Project Area at some time during their life cycle. The eleven MIS chosen for the Project Area represent the diverse habitat needs of landscape, community, and stand-scale species and provide a means to monitor biological diversity. Table 3-11 shows the habitat capability by VCU for the MIS in the Project Area. Habitat capability for all MIS is sufficient to support viable populations. Table 3-9 displays the range of wildlife habitats that occurs and the relative abundance and distribution of each habitat by VCU. Habitats are well connected by stream corridors, beach fringe, and other unharvested areas for wildlife movement within the Project Area. Several undisturbed watersheds exist where ecosystem processes occur naturally and large areas of unfragmented old-growth timber support species with large home ranges, aversion to edge or sensitivity to disturbance from management activities.

Watershed and Fish

Glacial history has played an important part in the placement and character of much of the soil parent material. Soil development is influenced by high levels of rainfall, cool summer temperatures, a short growing season, and moderately low soil temperatures. Under these conditions, organic matter decomposes slowly and accumulates where it is being produced or deposited. Available nutrients can leach rapidly. Because of the high rainfall, mineral soils are subject to erosion when not protected by an organic duff layer. In general, the characteristics of the parent material, topography, vegetation, and soil development, influence the features of soils that affect and are affected by timber harvest activities. Soils influence the overall vegetative composition and productivity of timber, fish, and wildlife in the Kelp Bay Project Area.

Summary of Soil Groups

Soil types can be grouped by typical properties that influence the use and management of an area. Table 3-19 shows the extent of several soil groupings based on characteristics, productivity, common hazards, and limitations of soil types that occur in the Kelp Bay Project Area.

Table 3-19
Acres of Major Soil Groups by VCU

VCU	Hemlock Forested Uplands	Alpine Forested Wetlands	Riparian	Estuarine	Alpine/ Sub-Alpine	Non-Forested Wetlands	Other Soil Groups	Total
293	4,621	1,888	152	679	4,840	1,558	0	13,738
294	5,507	850	1,198	361	14,494	1,399	31	23,840
295	2,552	438	1,174	97	7,451	274	264	12,250
296	6,055	1,704	391	448	6,810	377	293	16,078
297	5,807	3,971	51	422	3,489	2,014	30	15,784
298	2,849	804	1,077	225	22,887	549	33	28,424
314	1,639	761	2,164	357	23,107	285	6,978	35,291
315	3,930	730	194	151	2,411	932	112	8,460
Total	32,960	11,146	6,401	2,740	85,489	7,388	7,741	153,865

SOURCE: West et al., 1990.

Surface Erosion

Surface (particulate) erosion may be the result of wind, gravity, or water. Surface erosion occurs when vegetation and/or the protective organic mat is removed or disturbed, exposing mineral soil. Most undisturbed soils in the Kelp Bay Project Area are resistant to surface erosion. However, natural surface erosion sources do occur within all watersheds (i.e., along streambanks, on landslide scars, snowslide and avalanche paths, and within V-notches).

Timber harvest activities might increase the erosion rate (accelerated erosion) by exposing the mineral soil in road surfaces or road bank cuts. Grass seeding and fertilization greatly reduce most of the surface erosion resulting form roading (excepting on the road running surface). Removal of timber may also expose mineral soil as the falling tree strikes the ground, when logs are dragged over areas with little protective organic mat, or my extensive operation of vehicular traffic on unprotected soils. Directional tree falling and whole or one-end log suspension might be required on areas identified as being susceptible to accelerated surface erosion. Off-road vehicular traffic will be restricted on areas identified as being soil sensitive.

Soil Movement

The potential for sediment production (sedimentation of streams) is based upon soil properties that are important when a site is disturbed by nature or management activities. Most undisturbed soils in the Kelp Bay Project Area are resistant to surface erosion because relatively thick layers of surface organic matter and surface mats of vegetation act as protective covers to minimize surface erosion. However, natural areas of surface erosion and mass wasting do exist, including streambanks, landslide scars, snowslide or avalanche slopes, and V-notches.

The four mass movement hazard classes (extreme, high, moderate, and low) group soil/landtype units with similar properties by the stability of natural slopes and rank these soil units according to their relative potential for mass wasting. The Forest Service avoids scheduling timber harvest or road building on the extreme hazard soil units that are least stable and have the greatest probability of slope failure. Extreme hazard soil units include shallow, fine-textured soils on slopes of 75 percent or greater, and some soils with restricted drainage on slopes in excess of 65 percent. The majority of all naturally occurring landslides are found on extreme hazard soil/landtype units. These areas often have visible indications of instability or past failures, such as slide scarps, tension cracks, jack-strawed trees, or disturbance preferring plant communities. Table 3-20 lists the total acreage of each mass movement class by VCU for the Kelp Bay Project Area.

Soil mass movement, also referred to as landslides, is the dominant process of natural erosion in Southeast Alaska. The Forest Service has inventoried over 3,800 natural, large-scale landslides that have occurred in the Tongass National Forest within the past 150 years (Forest Service, 1977), some of which did occur on slopes having a high soil mass wasting hazard rating. Many landslides occur during or immediately after periods of heavy rainfall and snowmelt when soils are saturated. Steep slopes with compacted glacial till or bedrock sloping parallel to the surface are particularly hazardous areas. When subjected to heavy rainfall, these areas have a high likelihood of mass movement, especially if blasting occurs during periods of soil saturation, when side casting excavated material, or with logging practices that cause substantial surface disturbance.

Table 3-20
Total Area of Each Mass Movement Class for the Kelp Bay Project Area by VCU (acres)

			Total Area		
VCU	Low	Moderate	High	Extreme	Total
293	7,897	2,606	2,524	711	13,738
294	9,724	3,094	7,827	3,195	23,840
295	4,314	1,968	3,743	2,225	12,250
296	8,452	2,819	3,316	1,491	16,078
297	11,685	2,760	1,158	181	15,784
298	8,535	2,250	12,257	5,382	28,424
314	14,012	1,747	13,989	5,543	35,291
315	6,444	1,075	427	514	8,460
Total	71,063	18,319	45,241	19,242	153,865

SOURCE: West et al., 1990.

Vegetation, such as tree roots, seems to have a stabilizing effect on slopes, but tree roots lose strength 5 to 7 years after the tree is cut. With a decrease in soil-holding capability, soil movement on steep slopes following clearcutting is much more likely. Further, the displaced roots of uprooted trees disturb the soil mantle whenever windthrow occurs.

Under natural conditions, windthrow is an important triggering device of debris avalanches and debris flows in Southeast Alaska. The degree of predictability is complicated by an interaction of factors such as soil depth, texture, and coarse fragment content.

Water Quality

Fish and the aquatic resources in the Kelp Bay Project Area provide major subsistence, commercial, and sport fisheries. Abundant rainfall, streams with glacial origins, and watersheds with high stream densities provide a number of diverse fish habitats. These abundant aquatic systems provide spawning and rearing habitats for several salmon and freshwater species. Maintenance of this habitat and associated high water quality is a focal point for the public, for State and Federal natural resource agencies, as well as for individuals and various user groups.

Key water quality parameters identified in the State of Alaska water quality criteria for maintaining natural productivity of stream, lake, and estuarine biota include:

- Fine sediment and turbidity
- pH
- Water temperature
- Dissolved oxygen
- Stream chemistry

Sediment

Sediment concentration in the water column and intrusion of fine sediment into spawning gravel are important factors influencing aquatic productivity. Direct impacts from sediment concentration include filling gravel pore spaces which reduces water circulation necessary for egg survival and development. Sediment also retards emergence of the young fish after hatching. Young fish can die within the gravel if fine sediment blocks movement through gravel to open water. During winter, young salmonids use spaces between gravel and rubble to escape the effects of low water temperatures and ice. When these spaces fill with sediment, the young fish must use energy to maintain themselves in the current, thereby reducing survival. Also, salmonids are generally sight feeders and turbid water reduces their feeding efficiency. Suspended sediment may also irritate the mouth and gills of young fish and, if persistent, can erode the gills of larger fish. Such damage may increase fish stress, leading to increased susceptibility to disease. Sediment indirectly affects fish by reducing populations of aquatic insects which are important fish food, thereby reducing the number of fish that can be produced from a stream section. Also, as rearing pools fill with sediment, rearing space is reduced, lowering habitat capability, increasing stress and vulnerability to predators.

Alaska Water Quality Standards require that turbidity (a measure of suspended sediment) not exceed 25 NTU (see Glossary) over natural conditions for propagation of fish and that fine-sediment (0.1 mm to 4.0 mm) concentrations may not increase by more than 5 percent or exceed a total of 30 percent by weight in stream gravels (ADEC, 1989). Natural suspended sediment concentrations in the Portage Arm barometer watersheds are typically very low, averaging 2 to 2.5 mg/l or less than 10 NTU during normal runoff conditions. However, natural sediment concentrations in non-glacial watersheds occasionally exceed 100 mg/l during fall flood events (Forest Service, 1990c). No sediment data is available to show the response of these watersheds to timber harvest and road construction activity that occurred during the 1960s and 1970s. Similarly, no data is available for Kelp Bay watersheds relating to fine-sediment concentrations in stream gravels. However, those watersheds dominated by granitic rock types, primarily Catherine Island watersheds, are more likely to have naturally high concentrations of fines in gravel substrate because of the high proportion of sand-sized sediment particles that result from weathering of granitic rock.

Glacial River is significantly influenced by glacial melt runoff and has higher suspended sediment concentrations and finer in-river gravels than the non-glacial watersheds in the analysis area. No sediment measurements are available for Glacial River, but average suspended sediment concentrations (20 and 100 mg/l) should be similar to other glacial streams in Southeast Alaska (Forest Service, 1990c).

Landslides have a major influence on stream sedimentation throughout Southeast Alaska. A regional study (Swanston, 1989) indicates that about 3 percent of major landslides directly impact fish-bearing streams. Two recent, extremely large, natural mass wasting events have impacted two small drainages in the Kelp Bay Project Area. A natural rockfall recently filled a large portion of a small headwater lake in a Portage Arm watershed Q36A. Another debris avalanche event resulted in significant channel aggradation and fish habitat degradation in the mainstem channel of watershed Q44A on Catherine Island.

pH

pH is another important factor that influences aquatic ecosystems. This parameter indicates the degree of dissociation of weak acids and bases in natural waters. This is important because it effects the toxicity of many compounds, particularly heavy metals such as copper.

Water quality data collected in the Project Area have a pH range between 6.5 and 7.6 (Paustian, 1991). These measurements are within the standards established for growth and propagation of fish (pH 6.5 to 9.0) by the State of Alaska (ADEC, 1989).

Water Temperature

Stream temperature is a very important factor regulating biologic functions in the aquatic environment. Metabolic activities of most stream organisms are controlled by water temperature. Warming of streams above optimum temperatures (57°F) can affect fish by increasing respiration and biological oxygen demand, resulting in increased stress. Warmer water holding less oxygen than colder water compounds the problem. Stress increases susceptibility to disease and can also lead to decreased growth rate and increased mortality. Those streams with a south or southeast aspect draining large areas of muskeg are most susceptible to temperature increases. Inter-gravel flow tends to keep water cool, while flow over exposed bedrock tends to increase water temperature. No Project Area streams have identified high temperature problems.

Low winter temperatures may be an important limiting factor to fish production by reducing water flows and creating anchor ice. Anchor ice occurs when water, at or slightly below 32°F begins to freeze and attaches to the stream bottom, creating an ice layer that water flows over. This ice layer can reduce flow through gravel which affects developing embryos or diverts water away from rearing fish causing mortality. The frequency and extent of this mortality within the study area is not known.

State Water Quality Standards have established upper temperature limits between 55°F and 59°F for propagation of fish. No standards have been established for cumulative temperature changes. Low summer temperatures in many of the glacial- and snowmelt- influenced watersheds in the analysis area may be a limiting factor to productivity of aquatic communities. Stream temperature for one of the small barometer watersheds on Portage Arm for November 1979 ranged from a minimum of 38°F to a maximum of 43°F with a mean of 40°F. Summer temperatures measured in June 1980 at this site ranged from a minimum of 46°F to a maximum of 53°F. However, summer temperatures in outlet streams of small lakes are likely to approach the 55°F under natural conditions. In contrast, water temperatures in glacial melt water or snowmelt dominated drainages may be 2°F to 3°F cooler on the average than rainfall-groundwater fed streams.

Dissolved Oxygen

Another water quality concern is the contribution of elevated stream temperature to depletion of dissolved oxygen in southeast Alaska streams. Little monitoring or research information is available regarding the relationship of elevated stream temperature and oxygen depletion to documented fish kills. The Alaska non-point pollution control strategy has identified stream temperature and dissolved oxygen as a priority for water quality research and monitoring.

There are no dissolved oxygen data available for streams in the Kelp Bay Project Area. However, as noted previously, there are no known instances of fish mortality in the Project Area that could be related to high temperature or dissolved oxygen depletion.

Stream Chemistry

Dissolved solute concentration is an important indicator of basic stream productivity. Dissolved solids concentrations of surface waters in the Kelp Bay Project Area are well under 100 mg/l and well within State Water Quality limits. In pristine watersheds, total dissolved solids (TDS) concentrations are determined by the underlying bedrock lithology.

The Catherine Island and Glacial River watersheds have much lower dissolved solids concentrations than the majority of watersheds within the Kelp Bay Project Area. Other factors being equal, streams with high dissolved solids have higher primary aquatic production. Water chemistry data indicate that dissolved nutrients may be a limiting factor to primary aquatic production and resident or rearing fish populations in the Catherine Island and Glacial River watersheds.

Large Woody Debris

Large woody debris (LWD), trees and tree pieces greater than 4 inches in diameter and 10 feet long, is one of the most important components of high quality fish habitat. This material provides food and building materials for many aquatic life forms, provides cover for juvenile and adult fish, and is the primary channel-forming element in some channel types.

The key to the benefits provided by LWD is its gradual entry into the aquatic system. Large amounts entering abruptly can be detrimental to the aquatic ecosystem by becoming a physical barrier and causing bank erosion and channel migration problems. In most cases, however, gradual input of large woody material is essential to maintaining stream productivity.

Past national forest management practices have reduced the total amount of large in-channel woody material in some streams on the area. Roads were often built in the mainstream channel floodplains and timber was harvested adjacent to these roads, often to the edge of the streams. Stream cleaning operations were commonly conducted to prevent perceived fish passage problems.

Stream Classification

A method of stream classification is used to categorize stream channels based on their fish production values. There three stream value classes on the Tongass National Forest and in the Project Area are described below.

Class I

Class I streams contain anadromous (fish ascending from oceans to breed in freshwater) or adfluvial (fish ascending from freshwater lakes to breed in streams) lake and stream fish habitat. Habitat upstream from migration barriers known to be reasonable enhancement opportunities for anadromous fish and habitat with high value resident sport fish populations is also included.

Class II

Class II streams are streams with resident fish populations and generally steep gradients (often 6 to 15 percent), and can also include streams from 0 to 5 percent gradient where no anadromous fish occur. These populations have limited sport fisheries values. Class II steams generally occur upstream of migration barriers or are steep gradient streams with other habitat features that preclude anadromous fish use.

Class III

Class III streams have no fish populations but have potential water quality influence on the downstream aquatic habitat.

Table 3-21 lists all the cataloged streams in the Project Area by VCU, watershed, and miles of anadromous and resident habitat. Table 3-22 shows the miles of Class I, II, and III streams in each VCU.

Table 3-21

Summary of Kelp Bay Project Area Streams by VCU, ADF&G Anadromous Stream Catalog Number, Name, Watershed Number and Miles of Fish Stream

VCU	ADF&G Stream Number	Name	Watershed Number	Miles Anadromous	Miles Resident
293	113-51-10		P83A	2.14	0.40
	113-54-05	Appleton Cr.	P81A	2.82	8.76
	113-54-04		P82A		
	113-54-03		P82A	[0.72][1]	[4.24]
	113-54-02		P82A		
	113-54-01		P82A		
294	113-53-03	Saook Cr.	Q11A,B,C	8.82	11.31
	113-53-01		Q15A	0.12	3.93
	113-53-02		Q14A	0.11	0.33
	113-53-04		Q12A	0.16	0.11
295	113-52-04	Lake Eva Cr.	Q21A	7.38	6.03
296	113-52-03	Twin Lake Cr.	Q31A	0.08	2.63
	113-52-02		Q32A	0.87	2.31
	112-21-92		Q35A	0.53	2.73
	112-21-90		Q36A	0.40	2.29
	112-21-100		Q54A	2.48	2.52
297	113-52-01		Q41A	1.29	0.88
	113-51-09		Q43A	1.96	1.97
	113-51-08		Q44A	1.16	1.74
	113-51-07		Q46A	1.19	1.59
	112-11-17		Q47A	[2.70]	[0.00]
	112-11-16		Q47A		
	112-11-15	Local Cr.	Q51A,B,C	9.31	3.22
	112-11-14		Q52A	0.78	1.26
	112-11-13		Q53A	1.99	1.35
	112-11-129		Q54A	[2.48]	[2.52]
	112-11-127		Q54A		
298	112-21-08	Middle Arm	Q61A	5.01	18.74
	112-21-07		Q61B	0.10	4.14
	112-21-06	Bourbon Cr.	Q64A	0.66	8.00
314	112-21-05	Clear River	T72A	4.61	7.94
	112-21-04	Glacial R.	T71A	3.25	15.26
315	112-21-03		T81A	[1.07]	[3.39]
	112-11-12	Cosmos Cove	T81A		
	No number	Pond Island	T82A	0.83	0.02

SOURCE: Starostka, 1990.

[1] Some stream lengths are summarized by entire watersheds and are indicated by brackets ([]).

Table 3-22
Miles of Class I, II, and III Streams by VCU

VCU	Class I	Class II	Class III	Total
293	10.8	9.2	4.1	24.1
294	14.1	21.9	24.7	60.7
295	10.5	6.0	8.8	25.3
296	11.0	14.6	14.1	39.7
297	19.4	14.1	11.8	45.3
298	17.2	22.5	38.1	77.8
314	16.2	15.5	36.4	68.1
315	4.5	2.1	9.6	16.2
Total	103.7	105.9	147.6	357.2

SOURCE: Starostka, 1990.

Fish

The aquatic resources of the Kelp Bay Project Area are extremely important to residents of Angoon, Sitka, Kake, and other local communities. Fish and shellfish are harvested by a diverse group of users.

Purse seiner hauling in a load of salmon. Fish resources of the Kelp Bay Project Area are important to residents of Angoon, Sitka, Kake, and other local communities.

Four species of salmon (pink, chum, coho, and sockeye), two species of trout (cutthroat and rainbow) and one species of char (Dolly Varden) inhabit the freshwater within the area and king salmon inhabit estuaries and bays. A freshwater form of sockeye salmon, the kokanee, is found in one lake. Dolly Varden char, cutthroat, and rainbow trout are present in both resident and anadromous forms. A number of non-game fish species including sculpin, stickleback, and smelt occupy national forest waters (Taylor, 1979).

Crab, shrimp, clams, mussels, and various marine fishes are associated with the estuaries and surrounding waters. Anadromous salmon and trout are vitally dependent on estuaries during some lifestage. Herring and other important saltwater fish also use these areas for spawning and feeding.

The Project Area has approximately 65 miles of stream accessible to anadromous fishes, 120 miles inhabited by resident fish, and 745 surface acres of lakes. The Kelp Bay Project Area also has approximately 10,125 acres of estuaries (Table 3-23).

Fish production in these aquatic habitats is closely linked to water quality and quantity. Good water quality and favorable year-round stream flows support productive and valuable fisheries in the Project Area. The water quality of Southeast Alaska generally is good in terms of sediment levels, temperatures, and water chemistry. A combination of steep slopes, heavy precipitation, and the limited soil water-holding capacity of watersheds results in fairly predictable seasonal stream-flow characteristics.

Table 3-23
Aquatic Habitats by VCU

VCU	Number of Streams	Miles Anadromous	Miles Resident	Acres Estuary	Acres of Lakes
293	6	7.8	9.2	750	33
294	4	13.8	20.4	1,480	49
295	1	8.4	6.0	807	261
296	5	8.3	9.6	2,058	151
297	11	13.6	14.5	255	33
298	3	11.0	12.7	2,705	46
314	2	15.0	16.0	1,685	96
315	3	1.9	3.4	385	76
Total	35	79.8	91.8	10,125	745

SOURCE: Starostka, 1990.

Management Indicator Species (MIS)

Coho and pink salmon have been selected as MIS for anadromous species and Dolly Varden trout has been selected to represent resident species.

Pink (humpback) and coho (silver) salmon were selected to represent two different phases of salmon life history: spawning/egg incubation and freshwater rearing. Pink salmon, the most widely distributed of the salmon, spawn in freshwater from July through September. Immediately upon emergence from the gravels, juveniles go to sea where they mature in 2 years. They are very important to the commercial fishery of Southeast Alaska where they represent the greatest poundage harvested. Pounds harvested averaged 85 million between 1979 and 1988 (Forest Service, 1990b). Spawning gravel quantity and quality limits pink salmon freshwater habitat capability.

Coho salmon also spawn and incubate in freshwater, but after emergence from the gravels, juveniles rear in freshwater for 1 to 3 years. After attaining a size of about 4 to 6 inches, the juvenile coho migrate from freshwater to the ocean where they mature in 3 to 5 years reaching 8 to 11 pounds. Coho are very important to the commercial troll fishery and marine sport fishery of the region. An average of 1.67 million fish per year between 1979 and 1988 (Forest Service, 1990b) were harvested in Southeast Alaska. Typically, the period of freshwater habitation limits coho freshwater habitat capability.

Dolly Varden char were selected to represent resident fish habitats because of their wide distribution, availability of data on the species' habitat requirements, and distribution over the full spectrum of resident fish habitats. Dolly Varden are also present in their anadromous form on the area.

Demand for Fisheries

Commercial demand for salmon exceeds the supply as described in the Gap Analysis (Northern Southeast Regional Planning Team, 1987). Sport fishing license sales doubled in the 1970s and are expected to keep increasing (Forest Service [B]). Subsistence demands are expected to increase as more people move into rural Southeastern Alaska. Non-consumptive uses of fish (viewing and catch and release) are expected to increase (Connelly and Brown, 1988). The fisheries resource in the Project Area can help meet this demand if fish habitat capability is maintained and enhanced through management activities.

Threatened, Endangered, or Sensitive Fish Species

There are no known threatened, endangered, or sensitive fish species in the Kelp Bay Project Area.

Special salmon opening near the Hidden Falls fish hatchery. Demand for commercial salmon currrently exceeds the supply. The fisheries resources in the Kelp Bay Project Area help meet this demand.

Recreation

The Tongass National Forest possesses a remarkable and unique combination of features, including inland waterways with over 8,000 miles of shoreline, mountains, fiords, glaciers, and large populations of wildlife and fish that provide opportunities for a wide range of recreational experiences. The Kelp Bay Project Area contains many of these features including 153,120 acres of land; 745 acres of freshwater; and 157 miles of shoreline (including many small off shore islands and rocks). Approximately 13,224 acres within the Project Area have previously been harvested and roaded. These developed lands are located in Appleton Cove, Saook Bay, Hanus Bay, the north shore of Catherine Island, Bourbon Creek, and near The Basin.

While the large acreage is impressive and contributes to the feeling of vastness and solitude, it is also deceiving in the amount of land area that is actually available and useable for outdoor recreation. The difficult and steep terrain, wetlands, snow fields and glaciers, and heavy vegetation cover confine most of the recreational activities to the accessible shorelines, river and stream bottoms, and around the lakes. Roads exist in locations where timber harvest has taken place in the past; however, because there is no connection to other systems, little recreational use is made of them. In addition, alder growth on the roads has reduced travel on them to little more than wildlife trails.

The Kelp Bay Project Area has the potential to provide a wide variety of recreation settings. The Forest Service uses the Recreation Opportunity Spectrum (ROS) to help identify, quantify, and describe these settings. The ROS system portrays a range of recreation activities, settings, and experiences from primitive to urban (See the Glossary for definition of ROS and the specific ROS classes). The recreation resource of the Kelp Bay Project Area has opportunities that span the primitive end of the spectrum of recreation opportunities. The ROS classes found in the Project Area are Primitive, Semi-Primitive Non-Motorized, Semi-Primitive Motorized, and Roaded Modified. Table 3-24 displays the acres of each ROS class for each VCU. Because recreation activities are, for a large part, confined to the accessible shorelines, Table 3-25 displays the miles of shoreline within each ROS class for each VCU. Although there is approximately 157 miles of shoreline within the Project Area, some of these miles include offshore islands and rocks. So for purpose of this analysis of recreation opportunities, only 144 miles of shoreline were included.

Another aspect of recreation in the Kelp Bay Project Area is the 25 inventoried Recreation Places that total 35,392 acres. A Recreation Place is an identified geographic area having one or more physical characteristics or features that is particularly attractive to people engaging in recreational activities. They may be beaches, streamside areas, road or trail corridors, or areas surrounding lakes, cabins, or anchorages. Each Recreation Place has activities associated with it such as viewing scenery/wildlife, boating, hiking, stream/saltwater/lakes fishing, dispersed camping, and big game hunting. Table 3-26 displays the Recreation Places within the Project Area and some of the physical charateristics or features associated with each one.

Table 3-24
Existing Recreation Opportunity Spectrum Classes in Acres by VCU

VCU	Primitive	Semi-Primitive Non-Motorized	Semi-Primitive Motorized	Roaded Modified	Total
293	11	10,783	523	2,421	13,738
294	9,354	12,821	724	941	23,840
295	8,286	2,590	1,374	0	12,250
296	286	13,381	343	2,068	16,078
297	0	11,870	1,549	2,365	15,784
298	18,914	8,315	0	1,195	28,424
314	33,326	1,765	0	200	35,291
315	1,081	5,042	1,128	1,209	8,460
Total	71,528	66,567	5,641	10,399	153,865

SOURCE: Nelson, 1991b.

Table 3-25
Miles of Shoreline for Each ROS Class by VCU

VCU	Primitive	Semi-Primitive Non-Motorized	Semi-Primitive Motorized	Roaded Modified	Total
293	0.00	4.02	4.32	5.82	14.16
294	0.00	5.48	5.21	4.30	14.99
295	0.00	0.00	3.90	0.00	3.90
296	0.00	15.49	4.63	9.03	29.15
297	0.00	0.00	13.22	7.78	21.00
298	5.08	8.45	0.00	1.73	15.26
314	7.65	4.98	0.00	0.99	13.62
315	0.00	20.09	3.10	8.94	32.13
Total	12.73	58.51	34.38	38.59	144.21

SOURCE: Nelson, 1991b.

Table 3-26
Recreation Places and Their Features (Including the VCUs and Acres of Recreation Places)

VCUs	Recreation Place	Features	Acres
293	Rodman Creek	None in Project Area	346
293	Appleton Cove	Anchorage, Roads	2,462
293, 294	Saook Bay, West Shore	Sandy Beach, Campsite	98
294	Saook Bay, West Entrance	Scenery, Campsite	37
294	Saook Bay	Anchorage, Roads	935
294	Saook Bay Islands	Shoreline, Islands	25
294	Pt. Kennedy to Pt. Moses	Shoreline	558
294, 295	Lake Eva	Cabin, Shelter, Trail	·1,373
296	Twin Lakes/L.L. Lake Eva	Scenery, Lakes	3,334
296	Hanus Bay Islands	Anchorage, Shoreline	51
296	Catherine Is. SW Shore North	Sandy Beaches, Anchorage	155
296	Catherine Is. SW Shore South	Sandy Beaches, Rocks	201
296	Echo Cove	Anchorage, Beaches	445
296, 297	Portage Arm and Catherine Is.	Anchorage, Trail, Roads	5002
297	Catherine Is. East Shore	Shoreline, Beaches	932
298	Bourbon Creek	Anchorage, Roads	1,195
298	Middle Arm	Streams, Estuary	1,129
314	South Arm, N. Entrance	Sandy Beach	48
314	South Arm	Anchorage, Scenery	10,693
314	Goat Lake	Glacial Cirque, Lake	2,996
314, 315	South Arm to The Basin	Roads	887
315	South Arm, S. Entrance	Beach, Scenery	17
315	The Basin	Anchorage, Scenery, Roads	792
315	Pond Island	Anchorage, Campsites	701
315	Cosmos Cove	Anchorage, Estuary	980
Total			35,392

SOURCE: Nelson, 1991b.

The Glacial River is the only feature in the Kelp Bay Project Area being considered for a national designation. It has tentatively been identified as eligible for inclusion in the National Wild and Scenic Rivers System in the preferred alternative of the Draft EIS for the revision of the Tongass National Forest Land Management Plan. The Wild and Scenic Rivers Act of 1968 provides a means for recognizing and protecting the outstandingly remarkable scenic, recreation, geologic, fish and wildlife, historic, cultural, ecological and other values of selected rivers. Timber harvest and road construction activities are currently deferred from consideration in the Glacial River watershed until a final study and determination of eligibility can be made.

Two hikers enjoy the scenic surrounding of old-growth forest. The Kelp Bay Project Area offers a wide variety of recreatoinal settings, encompassing over 150,000 acres of land, 745 acres of freshwater, and 157 miles of shoreline.

Visual Quality

An important aspect of Southeast Alaska's natural resource base is its attractive setting. The importance of Southeast Alaska's scenic splendor is evident by increased tourism and a heightened awareness of and sensitivity to scenic resource values by Alaska's residents. A number of tools have been developed by the Forest Service to inventory and measure this visual resource: Visual Character Type, Existing Visual Condition (EVC), Visual Quality Objectives (VQO), and Sensitivity Level.

Visual Character Type

Visual Character Type describes a large area of land that has common characteristics of landform, rock formations, water forms, and vegetative patterns. The Kelp Bay Project Area is located in a Visual Character Type referred to as Baranof Highland and is described in detail in *Visual Character Types*, (Forest Service, 1979b). The terrain in this area consists of

an irregular, rugged chain of landforms deeply indented with fiords and having a steep eastern slope. Generally, landforms are visually massive with rocky crests and sharp ridges at the higher elevations. The conifer cover varies widely in density and is usually interspersed with muskeg and other lower forms of vegetation affording the viewer considerable variety.

Exisiting Visual Condition (EVC)

The EVC is an assessment of the level of visual quality that presently occurs on the ground. The EVC may range from Type I, where little or no human modification is apparent, to Type VI, where human-made changes in the landscape are in glaring contrast to the natural landscape. All of the EVC classes are further defined in the Glossary.

Generally, 82 percent of the Kelp Bay Project Area exists in a natural condition (EVC Type I), while 18 percent is in a heavily altered condition (EVC Type V), as a result of past timber harvest and road construction activities. The Lake Eva VCU (295) contains 90 acres of EVC Type II due to the Forest Service Recreation Cabin located on the shore of Lake Eva. EVC Type I are areas which have only ecological changes, with the exception of trails required for human access. These areas appear to be untouched by human activities. EVC Type V are areas in which changes in the landscape are strong and would be obvious to the average forest visitor. These changes stand out as a dominating impression of the landscape. They appear to be major disturbances.

The acreage in each EVC class for the individual VCUs is described in Table 3-27. No acres exist in EVC Types III, IV, or VI.

Table 3-27
Existing Visual Condition in Each VCU Within the Kelp Bay Project Area

	Existing Visual Condition Types						
	I		II		V		Total
VCU	Acres	%	Acres	%	Acres	%	Acres
293	6,729	49	0	0	7,009	51	13,738
294	20,462	86	0	0	3,378	14	23,840
295	12,119	98	90	1	41	1	12,250
296	10,412	65	0	0	5,666	35	16,078
297	9,999	63	0	0	5,785	37	15,784
298	25,003	88	0	0	3,421	12	28,424
314	35,138	99	0	0	153	1	35,291
315	6,205	73	0	0	2,255	27	8,460

SOURCE: Monaco et al., 1991.
Note: There are no acres of Existing Visual Condition Type III, IV, or VI in the Project Area.

Visual Quality Objectives (VQOs)

VQOs are a set of measurable goals for management of the visual resource on national forest System lands. They are statements of management direction for the visual resource for a specific area, and they may change as overall management direction for the area changes. The VQOs are based upon the variety in the landscape, the distance between the landscape and the people viewing it, and how much the landscape is viewed by people. The VQOs include Preservation (P), Retention (R), Partial Retention (PR), Modification (M), and Maximum Modification (MM) and are defined in the Glossary. VQOs provide a baseline from which to measure changes for use in managing national forest Lands.

In the Kelp Bay Project Area, 3 percent of the total 153,865 acres are classified Retention, another 46 percent is classified Partial Retention, 46 percent is classified Modification, and the remaining 5 percent is classified Maximum Modification. The VQO of Preservation allows for ecological changes only. It is assigned only to specially classifed areas including wilderness. There are no such areas within the Kelp Bay Project Area; therefore, there are no acres of the Preservation VQO. The VQOs in acreages and percent for the individual VCUs are shown in Table 3-28.

Table 3-28
Visual Quality Objectives by VCU Within the Kelp Bay Project Area

	R		PR		M		MM		Total
VCU	Acres	%	Acres	%	Acres	%	Acres	%	Acres
293	548	4	7,794	57	3,551	26	1,845	13	13,738
294	0	0	6,371	27	16,298	68	1,171	5	23,840
295	1,290	11	4,160	34	6,026	49	774	6	12,250
296	855	5	5,549	35	7,798	48	1,875	12	16,077
297	657	4	11,994	76	2,128	14	1,005	6	15,784
298	0	0	6,040	21	22,218	78	166	1	28,424
314	102	1	24,843	70	10,345	29	0	0	35,290
315	748	9	4,586	54	2,707	32	419	5	8,460

SOURCE: Monaco et al., 1991.

Sensitivity Level

Sensitivity Levels are the measure of people's concern for the scenic quality of the national forest. Sensitivity Levels are determined for land areas viewed by those who are travelling through the national forest. Three Sensitivity Levels are employed--Level 1, Level 2, and Level 3--with Level 1 including those areas having the highest level of user concern for the visual environment. Areas which are viewed from the Chatham and Peril Straits travel routes of the Alaska Marine Highway System and the heavily travelled small boat routes are areas of high visual sensitivity. Portions of VCUs 293, 294, 295, 296, 297, and 315 are visible from Chatham and/or Peril Strait and are given the highest visual sensitivity designation, Level 1.

Cruise ships like the MV Observer bring passengers into the Kelp Bay area to enjoy scenery, hiking, and sport fishing. Regularly traveled boat routes are considered areas of high visual sensitivity.

Roads and Facilities

This section describes the existing facilities in the Kelp Bay Project Area. There are over 50 miles of roads, a recreational cabin, a trail with a shelter, and an administrative site.

Roads

The Kelp Bay Project Area contains no public transportation facilities (state highways, ferry dock, or airports) and no established communities. Timber harvest and related national forest management activities are the primary purposes for transportation development.

Currently, the Project Area has 53.29 miles of roads (Table 3-29) or approximately 0.22 miles per square mile (Table 3-30). Of this total, 33.22 miles are Collector and 20.07 miles are Local (see the Glossary for definitions of Collector and Local roads). These roads originally connected to log transfer facilities at Appleton Cove, Saook Bay, Hanus Bay, Bourbon Creek, and The Basin. The existing roads were built during the early 1960s and mid 1970s and are at various levels of impassibility from alder growth, water barring, and the removal of culverts and temporary bridges.

Log Transfer Facilities (LTFs) and Logging Camps

The Kelp Bay Planning Area had six LTFs, and only five of these LTFs had logging camps associated with them. Camps were located at Hanus Bay, Bourbon Creek, Saook Bay, Appleton Cove, and North Basin. The logging camp at the North Basin LTF also served the South Basin LTF. These camps were dismantled following completion of timber harvest activities and no developments remain at the sites. Currently, only log rafts are stored at the Hanus Bay, Appleton Cove, and Saook Bay sites; the rest of the sites remain inactive.

Table 3-29
Current Roads in the Project Area by VCU

VCU #	Road No.	Type	Miles	Log Transfer Facility
293	7588	C[1]	5.50	Appleton Cove
	75881	L	0.70	
	75882	L	1.10	
	75883	L[2]	0.40	
	75884	L	0.90	
	Misc. spurs	L	3.94	
		Total	12.54	
294	7539	C	2.75	Saook Bay
	75391	L	0.50	
	Misc. spurs	L	0.50	
		Total	3.75	
296	7530	C	5.90	Hanus Bay
	7531	C	1.70	
	7532	C	2.20	
	7533	C	1.00	
	Misc. spurs	L	1.44	
		Total	12.24	
297	7530	C	4.50	Hanus Bay
	Misc. spurs	L	5.66	
		Total	10.16	
298	7535	C	4.30	Bourbon Creek
	Misc. spurs	L	1.52	
		Total	5.82	
314	7597	C	0.27	North Basin
	Misc. spurs	L	1.00	
		Total	1.27	
315	7536	C	2.90	North/South Basin
	7597	C	2.20	
	Misc. spurs	L	2.41	
		Total	7.51	
		Total Existing Roads	53.29	

SOURCE: Costa, 1990.

[1] Collector Roads (See Glossary for definitions).
[2] Local Roads.

Table 3-30
Current Road Density Within the Kelp Bay Project Area

VCU	Miles Existing	Square Miles	Road[1] Density
293	12.54	21.5	0.58
294	3.75	37.3	0.10
295	0.0	18.7	0.0
296	12.24	25.1	0.49
297	10.16	24.7	0.41
298	5.82	44.4	0.13
314	1.27	55.1	0.02
315	7.51	13.2	0.57
Totals	53.29	240	0.22

SOURCE: Costa, 1990.

[1] Road density is defined as the miles of road per square mile of total land area.

The Appleton Cove LTF was constructed in the early 1960s and has been inactive except for log raft storage since then. This was an A-frame facility with a timber bulkhead designed to allow low-velocity entry of logs into the water.

The Saook Bay LTF also was constructed in the early 1960s and has been inactive except for occasional log raft storage since then. This was also an A-frame facility with a timber bulkhead designed to allow low-velocity entry of logs into the water. It appears that both Appleton and Saook were harvested at the same time. The Saook logging camp was close to the LTF.

Hanus Bay LTF was first constructed in the early 1970s and used again in the 1976-1977 season (Burns, 1991). This area is used only for log raft storage. The facility was also an A-frame facility with a timber bulkhead designed to allow low-velocity entry of logs into the water. The logging camp was located at the site. A major crossing in Portage Arm ties VCU 296 with VCU 297 and is connected to the use of this LTF. This crossing is located in the tidelands area and had a fill from each side with a culvert in the middle.

The North Basin LTF was constructed in 1976-1977 and was last used in 1977 (Burns, 1991). The log trucks drove out onto the circular causeway, and a loader pushed the log bundles off of the trucks into the water. The logging camp consisted of land-based and floating facilities located at the site.

The South Basin LTF was also constructed and used during 1976-1977. This was a slide facility. The logging camp at the North Basin LTF was used while logging at this site.

The Bourbon Creek LTF was constructed in the mid 1970s and last used in 1977. Initially, a float-off approach was used, but this proved difficult to work because of the tides. The trucks were driven to the water's edge, and the bundles pushed off the trucks by a loader into the water. The logging camp consisted of land based and floating facilities located at the site.

Recreation and Administration Structures

The only other developments in the Kelp Bay Project Area are a recreational cabin on Lake Eva (VCU 295) and an administrative cabin in The Basin (VCU 315). The recreational cabin on Lake Eva and the trail with an Adirondack shelter are in this LUD II area, but the area is not being considered for timber harvest or road building. A second administrative cabin in Portage Arm (VCU 296) was under consideration as a recreational cabin, but it was destroyed during the winter of 1989 by a windthrown spruce tree.

Marine and Log Transfer Facilities

Double A-frame log transfer facility, similar to ones used in the 1960s and 1970s.

Southeast Alaska has approximately 30,000 miles of tidal shoreline representing roughly 60 percent of the total Alaskan coastline. Within the Kelp Bay Project Area, there are roughly 165 miles or 7,700 acres of shoreline habitat. (Miles of shoreline as it relates to marine habitat is greater than for recreation or other project analysis. This is due to consideration of LTFs in Rodman Bay, which adjoins the Project Area). The combination of habitats that collectively account for the diversity of Southeast Alaska's estuarine and marine environments occurs in within this tidal zone.

Two areas within coastal waters are discussed in this Draft EIS. The first is the marine system which consists of habitats exposed to the waves and currents of the open ocean, and the water regimes are determined primarily by the ebb and flow of oceanic tides. Salinities exceed 30 parts per thousand (ppt) with little or no dilution except within estuaries or at the mouths of streams. Shallow coastal indentations or bays characterize much of the coast (Cowardin et al., 1979) in the Kelp Bay Project Area.

The second area of consideration is the estuarine system. This system consists of deep water tidal habitats and adjacent tidal wetlands that are usually semi-enclosed by land but have open, partly obstructed, or sporadic access to the open ocean, and in which ocean water is at least occasionally diluted by freshwater runoff from the land. Evaporation may periodically increase the salinity above that of the open ocean. Along some low-energy coastlines there is appreciable dilution of sea water. In terms of wave action, estuaries are generally considered to be low-energy systems (Cowardin et al., 1979).

In the marine and estuarine systems, the areas are subdivided into the subtidal and intertidal zones. The intertidal zone is exposed and flooded by tides and includes the associated splash zone, while the subtidal zone is continuously submerged (Cowardin et al., 1979). In general, the estuarine systems are more productive than marine systems, and the intertidal and shallow subtidal area is the more productive portion of the coastal subzones (Odum, 1970).

The intertidal and subtidal environments may be subject to effects from log transfer and storage facilities because those are the points of concentrated activity associated with the marine transportation of logs. Activities outside the areas of concentration are widely dispersed and any potential effects would be short-term and/or below detectable thresholds (Forest Service, 1989c).

In *Some Effects of Log Dumping on Estuaries*, Schultz and Berg (1976) used species numbers as a criterion of diversity, not the percentage of species composition. The general belief is that higher numbers of species along a set distance is an indication of higher quality habitat. Tables 3-31 and 3-32 show the proposed LTFs, species diversity, and acres of habitat for the estuarine and marine systems in the Kelp Bay Project Area.

Table 3-31
Estuarine System Habitat Tributary to Each Proposed LTF Location

VCU	LTF Name	Species Diversity	Total Estuary Acres in VCU	Estuary Acres at Each LTF
293	Appleton Cove	13	760	439
296/297	Hanus Bay	14	895	149
314	South Arm	10	356	356
		Total	2,011	944

SOURCE: Burns, 1991.

Table 3-32
Miles of Marine Shoreline Tributary to Each Proposed LTF Location

VCU	LTF Name	Species Diversity	Shoreline Miles
293	Southeast Rodman Bay	23	20
292	Rodman Bay	15	20
294	West Saook	23	15
296/297	North Hanus Bay	20	50
298	Bourbon Creek	16	15
314	North Point	17	13
315	North Basin	17[1]	9
315	South Basin	17	17
315	Cosmos Cove	9	6
		Total	165

SOURCE: Burns, 1991.

[1] A subtidal survey was not conducted on North Basin in 1990. It is assumed this location is similar to the South Basin location (Hughes and Peterson, 1990).

During public scoping for the Kelp Bay Project Area, the public preferred that the Forest Service re-use previously developed LTFs where possible, instead of developing new locations. Twelve LTFs are being evaluated for use in the Kelp Bay Project Area. Seven sites under evaluation were used in previous harvests. These sites and their historical areas of impact are shown in Table 3-33.

Table 3-33
Comparison of Historical Use of Former LTF Sites, and Past Environmental Effects

VCU	LTF Location	MMBF	Period of Use	Type of Facility	Mean Bark Depth	Est. Area Coverage
293	Appleton Cove	44	1964-66	Bulkhead	5 cm	0.9 Acres[1]
	Rodman Bay	140	1962-64	Bulkhead	14 cm	2.8 Acres[1]
294	Saook Bay	26	1961-62	Bulkhead	14 cm	0.9 Acres[1]
296-7	Hanus Bay	96[2]	1971-77	Bulkhead	Debris	Unknown[3]
298	Bourbon Creek	14[2]	1974-76	Beaver slide	Debris	Unknown[3]
315	North Basin	15[2]	1975-77	Bulkhead	(Similar to below)	
315	South Basin	9[2]	1976-77	Beaver slide	15 cm	Unknown[3]

SOURCE: Burns, 1991.

[1] Schultz and Berg, 1976.
[2] Information taken from Chatham Area scaling records for the Alaska Pulp Corporation Long-Term Timber Sale Contract.
[3] Bark debris noted in 1990 subtidal survey, but depth and extent of debris not specifically measured (Hughes and Peterson, 1990).

In 1985, the Alaska Timber Task Force finalized a series of LTF siting, construction, operation, and monitoring/reporting guidelines. These guidelines specify the technically preferred sites for LTFs, log storage areas, camp settlements, and anchorages are deep bays or are along protected straits or channels. A copy of the Alaska Timber Task Force guidelines are in Appendix 4, Effects Analysis Report, Marine Environment, Implications for LTF Location (Burns, 1991). Other marine areas are not addressed in the EIS because they are not expected to be affected by activities associated with the timber harvest being proposed.

Land Status

Special Uses

There is one special use permit for outfitting and guiding in the Project Area. The operator works from a temporary camp on the western shore of Pond Island for 2 weeks during the late spring and 4 weeks in the early autumn. No other special use permits have been issued for recreational or non-recreational purposes.

Several big game guides, who are not currently under permit, use the heads of bays during the spring and fall for brown bear hunts. These guides operate from boats, taking their clients ashore in search of bears. It is anticipated that approximately 10 of these operators will be under permit during 1991 in the Kelp Bay Project Area.

Land Ownership

The Kelp Bay Project Area contains only national forest system lands, with no inholdings of private land or lands of other ownership. There are, however, opportunities for claims by other entities, that may result in changes in land ownership.

The Alaska Statehood Act of 1959 authorized the State of Alaska to select 400,000 acres of national forest system lands. The Alaska National Interest Lands Conservation Act of 1980 (ANILCA) provides that the State has until 1994 to complete its selections and that the State may select lands in excess of its remaining entitlement. However, only the actual entitlement will be conveyed from these selected lands.

The State of Alaska has completed its national forest selection process and most of the land requested has been approved by the Forest Service. At this time, no State selections occur within the Project Area. Minor changes in selected lands may occur in the future if the State relinquishes some acres and replaces them with selections in other locations prior to the 1994 deadline.

The Alaska Native Claims Settlement Act of 1971 (ANCSA) provided for conveyance of certain lands to the ten native village corporations, the two native urban corporations, and the one native regional corporation located in Southeast Alaska. The U.S. Department of Interior Bureau of Land Management issued regulations authorizing these corporations to select lands in excess of their entitlements. However, as with State selections, only the actual entitlement will be conveyed. Although all of the nativeselections have been made, this process is not complete. All of the land in T.51S., R.66E. CRM on the northeast corner of Catherine Island has been selected by both Kootznoowoo Inc. and Sealaska Corporation. Although this selection has been made, the actual conveyance of these lands to the two corporations may or may not occur.

The Alaska Native Allotment Act of 1906 provided that native individuals who had occupied lands prior to the designation as national forest could apply for conveyance of up to 160 acres. The Alaska Native Claims Settlement Act repealed the Native Allotment Act, eliminating future allotments. There are no native allotments in the Project Area.

Other Claims or Withdrawals

There is one lighthouse withdrawal on Fairway Island which lies off the northern shore of Catherine Island. Fairway Island was withdrawn for lighthouse purposes by an Executive Order on January 4, 1901. Structures on the 23-acre island include navigation markers, an abandoned house, outhouse, cement walkways and steps, and abandoned tramway. No timber harvest or road construction is proposed for Fairway Island.

There are no mining claims in the Kelp Bay Project Area.

Cultural

Cultural resources located on the Tongass National Forest are varied and numerous with sites and artifacts ranging from prehistoric times through historic periods; some date as far back as 10,000 years ago. Historically, Southeast Alaska has been the home of the Tlingit, Alaskan Haida (Kaigani), and the Tsetsaut. Of the three, the Tlingit have been dominant, controlling at one time or another the entire Southeast from just north of Yakutat Bay south to Dixon Entrance (Arndt et al., 1987).

Cultural sites and artifacts in the Tongass National Forest date back 10,000 years.

The Kelp Bay Project Area has been occupied solely by the Tlingit ethnohistorically. The origin of this cultural group and the development of their traditions remains an important research question. The oral traditions of many Tlingit clans indicate origins outside of Southeast Alaska. The Daqlawedi and Wuckitan indicate traditions of movement down the Stikine and Taku rivers, to the coast and from there spread out (de Laguna, 1960). Both groups are representatives of the Eagle phratey of the Angoon area. Historically, the Tlingit of Angoon have used the Kelp Bay Project Area. Documented interviews place emphasis within Kelp Bay itself. Evidence of their past land use throughout the area includes campsites, smokehouses, graves, resource areas, fish weirs, and rock shelters.

Cultural Resource Surveys

In the late 1700s, Russian, Spanish, French, English, and American traders and explorers launched some of the earliest explorations into Southeast Alaska. The establishment and colonization of the Russian-American Company in Yakutat and Sitka provided the impetus for European development and cultural influence in Southeast Alaska (Autrey, 1990). Explorations in the Project Area appear to have been poorly documented since little information during early contact can be found in the available literature. With the government-commercial stage of historic development, information becomes more readily available. Historic sites identified in the Project Area include cabins, trails, portages, shelters, fishing industry remains, camps, and fox farms. The remains of many of these sites, both historic and prehistoric, provide the only record of former human occupation, work areas, and lifestyles within the Project Area. There might also be sites within the Project Area which have religious or cultural significance for Native Americans that have not yet been identified.

In accordance with the National Historic Preservation Act of 1966, as amended, specifically Section 106; the National Environmental Policy Act of 1969; and a series of implementing regulations and policy direction, the Chatham Area of the Tongass National Forest is undertaking a program to identify, evaluate, preserve, and protect cultural resources as outlined in 36 CFR part 800. Specific direction has been incorporated into the Regional Guide from the Southeast Alaska Area Guide giving the following directions concerning the management of cultural resources as a non-renewable National heritage:

- Ensure cultural resource specialists input to project planning at the earliest possible time.

- Evaluate cultural resources for inclusion in the National Register of Historic Places.

- Forest Service plans and programs affecting cultural resources need to contribute to the preservation and enhancement of cultural resources and to assure access to sites or resources important to traditional Native religious practices, rites, or ceremonies.

- Avoid adverse effect where possible, or develop mitigation alternatives in consultation with the State Historic Preservation Officer and Advisory Council on Historic Preservation.

Thirteen surveys have been conducted at various levels of intensity, ranging from a test excavation of an identified cultural site to cursory surveys (simply walking through areas which look like they may contain archaeological sites), in the Project Area (Table 3-34). The bulk of these surveys was conducted by Forest Service personnel in support of the timber sale program. A few were conducted by the Sealaska Corporation in response to the ANCSA of 1971 which allows Native Corporations to select Native cemetery and historical sites in Southeast Alaska.

Seventeen sites have been identified in the Kelp Bay Project Area. Four sites have been tested, and many of the other areas only identified with no further verification processes completed. Specific locational information is protected to prevent vandalism or unauthorized use of a site.

Table 3-34
Cultural Resource Surveys in the Kelp Bay Project Area

VCU	Total No. Sites/VCU	Location	By Who	When
293	0	No Surveys conducted for this VCU to Date		
294	0	No Surveys conducted for this VCU to Date		
295	2	Lake Eva	Swanson/Davis	1982
		Lake Eva	Davis/Bedegrew	1989
296	2	Dead Tree Is.	Lyon/Wagner/ Lockhart	1975*
		Hanus Bay	Lyon/Wagner/ Lockhart	1975*
		Hanus Bay	Nelson/Symes/ Edenshaw	1975*
		Catherine Is.	Davidson Fields	1979
		Portage Arm	Davis/Thibault/ Stanford	1980
		Catherine Is.	Stanford Thibault	1980
297	6	Catherine Is.	Davis	1977
		Catherine Is.	Davidson Fields	1979
		Traders Is.	Moss	1979
		Traders Is.	Thibault Stanford	1980
		Catherine Is.	Stanford Thibault	1980
		Catherine Is.	Swanson Dolitsky Stipp	1985
298	2	Kelp Bay South Arm	Ackerman	1974
314	0	No Surveys conducted for this VCU to date		
315	5	Pond Is.	Ackerman	1974
		Cosmos Cove	Ackerman	1974
		The Basin	Ackerman	1974
		Crow Is.	Ackerman	1974
		Pond Is.	Davis	1977
		Cosmos Cove	Smith/Cantley/ Lightfoot	1981

SOURCE: Swanson-Iwamoto, 1990.
* Surveys conducted by Sealaska Corporation

Economic and Social

Nearly 80 percent of Southeast Alaska is within the Tongass National Forest, an area larger than the State of West Virginia. It is the largest national forest in the National Forest System. The Tongass stretches roughly 500 miles from Ketchikan in the southeast to Yakutat in the northwest and is mainly unpopulated wild country. Currently, only about 65,000 people live in 33 towns, communities, and villages located in or very near the boundaries of the national forest. No communities are located within the Kelp Bay Project Area.

The economies of most communities in Southeast Alaska depend almost exclusively on the Tongass National Forest to provide natural resources for fishing, tourism, recreation, timber harvesting, mining, and subsistence. Because very little private land exists to provide these resources, people who earn their living in the national forest are concerned about maintaining its abundant natural resources.

In addition to economic activity, the quality of people's lives is greatly enhanced by the physical environment associated with the national forest. To many, Southeast Alaska is viewed as what America was like 200 years ago. Alaska has always been known as a wild and magnificent place, a vast expanse of seemingly limitless scenery and vast natural resources. People who live here and people who have never even seen Alaska think of it as The Last Frontier.

Many Southeast Alaskans want to keep that which makes their part of the world unique. At the same time, they want to continue maintaining their economic livelihood. With a limited resource base, resolution of this conflict is increasingly difficult. A look at current and expected future conditions in areas influenced by the proposed actions in the Kelp Bay Project Area will be useful to project possible changes in the economic and social environment that would result from implementing an alternative.

Area of Influence

The primary area of influence for the Kelp Bay Project Area is Southeast Alaska. Within Southeast Alaska, the economic and social environment affected by the proposed actions in Kelp Bay, include:

- Communities close to the Project Area that benefit commercially from the fish, wildlife, and recreational opportunities;

- Communities with production facilities that use the timber; and

- Communities whose residents visit the Project Area to hunt, fish, or pursue various recreational activities.

Angoon, the closest community to the Project Area, is approximately 12 miles across Chatham Strait. Commercial fishermen, outfitter guides, and support services in Angoon, Sitka, Juneau, and other small communities benefit financially from the fish, wildlife, and recreational opportunities in the Project Area.

Most of the timber sold from the Tongass National Forest receives at least primary processing in mills located in Southeast Alaska. The two communities with production facilities using the timber from the Project Area are Sitka with its pulp mill and Wrangell with its sawmill.

Local residents make up 2.2 milion of the 2.8 million recreation visitor days that occur annually on the Tongass National Forest. Residents from Angoon, Sitka, Kake, Port Alexander, Tenakee Springs, and other nearby communities visit the area for hunting, fishing or other recreational activities. As a group, the local communities that have ties directly or indirectly to the Project Area form a large part of what is referred to as Southeast Alaska. In general, employment, personal earnings, and the well-being of the population in the individual communities follows the rise and fall of economic activity in Southeast Alaska as a whole.

Population

The majority of communities in Southeast Alaska are small, isolated, and are accessed only by air or water. Many of these communities have populations of less than 2,000. Table 3-35 displays the populations of specific communities in Southeast Alaska that may be affected by the proposed action. It also displays the percentages of the total population that is native.

While native populations nationwide are only 1 percent of the total population, they comprise 13 percent of Southeast Alaska's population. Some Southeast Alaska communities have a greater proportion of Alaska Natives than non-natives in their populations. Angoon and Kake have populations that are over 60 percent native.

Table 3-35
Population of Some Communities in Southeast Alaska

Towns and Villages	Population	Percent Native	Distance by Water from Kelp Bay
Angoon	528	83	12
Kake	645	62	44
Port Alexander	108	5	72
Sitka	8,196	18	48
Tenakee Springs	95	6	36

SOURCE: Thomas, 1990.

Lifestyles

The lifestyles, values, and economic pursuits of Southeast Alaska residents are highly diverse. Many people live in Southeast Alaska because of the opportunity to participate in resource-extraction occupations; others desire the lifestyles afforded by remote, uncrowded living situations, and the chance to be close to their families and friendship networks. Other people choose to remain in Alaska because of the hunting and fishing opportunities, and the chance to live in close proximity to a wilderness environment. Many Native residents remain attached to Southeast Alaska because it provides the biophysical context of their cultural heritage. This diversity of attitudes, values, and lifestyles suggests that the proposed timber harvest and road construction will affect some people positively, others, perhaps, negatively.

Community Stability

Community stability is a very important consideration in planning a resource management activity in the national forest, but it is also a difficult element to describe accurately. Jobs, incomes, receipts, and multipliers are somewhat useful but do not portray the total picture, particularly the quality of life aspects.

The balance of a variety of natural and human-related resource activities is important to communities in Southeast Alaska. Management of the Tongass National Forest has impacts throughout the region. Many Southeast Alaska residents derive their livelihood from forest-related activities. Most of them also personally participate in a wide variety of activities dependent on the national forest. For both reasons they have a keen interest in the proposed activities for the Kelp Bay Project Area.

The recreational activities and environmental attributes offered by the Tongass National Forest are central components of life in the small communities located around the Kelp Bay Project Area. The economic base of some of these communities depends in part on tourism. They are affected by changes in recreational opportunities and visual conditions in the national forest. They are also affected by changes in environmental quality, and benefit from opportunities for free and abundant resources and products from the national forest. Firewood, wildlife, and fish are among national forest resources important to local communities. The preservation of these national forest assets is of great importance to these communities.

Angoon as viewed from the waterfront. Residents from this community visit the Project Area for hunting, fishing, and other recreational activities.

The communities whose economic lives are tied to logging, saw and pulp mills, and related transportation and construction industries are also affected by changes in the supply of timber from the national forest and more specifically the APC Long-Term Timber Sale Contract. The productive use of the timber resource is an important value to them. The effects of national forest management activities is important to all communities in Southeast Alaska, and they have the potential to significantly impact community stability.

Economic Use of The Forest

The proposed actions in the Kelp Bay Project Area may affect the economic use of the forest by three major industries: timber, commercial fishing, and recreation including tourism. Table 3-36 displays 1988 employment information for these three major industries. For each industry, direct, indirect, and total employment is listed. In addition, the percent of the total Southeast Alaska employment of 30,850 jobs is shown. The significance of each industry to Southeast Alaska's economy and the dependence of each industry on land administered by the Forest Service are discussed below.

Each industry interacts with other sectors of the economy. So an action that affects one industry will impact other sectors of the economy as well. In addition, each of the three industries includes a number of subcomponents. The timber industry directly affects several economic sectors including heavy construction, lumber and paper products, and water transportation. The commercial fishing industry includes the harvesting, processing, manufacturing, support, and transporting fish or related products. The recreation and tourism industry directly affects several economic sectors including the retail trade, service, and transportation sectors. The industry includes guides and outfitters, tours and transportation services, and sport hunting and fishing support services.

Table 3-36

Direct and Indirect Employment for Three Major Industries, 1988

Industry	Direct Employment (Jobs)	Indirect Employment (Jobs)	Total Employment (Jobs)	Percent of SE Alaska Employment
Timber	3,341	2,350	5,691	18.4
Commercial Fishing	3,500	1,225	4,725	15.3
Recreation and Tourism	2,750	1,150	3,900	12.6

SOURCE: Thomas, 1990.

The timber industry in Southeast Alaska currently processes a wide range of spruce and hemlock logs into finished lumber products.

Timber Industry

Southeast Alaska's forest product mix includes dissolving pulp, logs, cants, dimension lumber, and woodchips. The industry's structure has changed significantly over the last 10 years. In 1980, the industry was focused on processing timber from the Tongass National Forest into cants and dissolving pulp. The sawmilling industry processed primarily large-diameter spruce logs. They were sawn just enough to meet the minimum federal standards for export. The smaller or defective spruce logs and most of the hemlock logs were chipped for pulping.

Currently, the forest products industry in Southeast Alaska processes a wide spectrum of spruce and hemlock diameter logs into finished lumber products. The wood wastes from the sawing process are chipped for sale. Between 1981 and 1985, total employment in the lumber and pulp mills dropped 29 percent and a number of the older and more inefficient sawmills were abandoned. However, after this structural change, the industry rebounded as market conditions improved, and direct employment increased to 3,516 jobs in 1989, up 81 percent from the low in 1985 and 19 percent above the previous high in 1981.

Because most of Alaska's forest products are exported, fluctuations in timber markets are primarily a function of the international marketplace and do not reflect activities of the region. In spite of these challenges, in 1989 the industry provided almost 16 percent more total employment than it did in 1980.

A constant supply of Tongass timber is not the only factor controlling timber employment. Other controlling factors include exchange rates, the overall Pacific Rim demand for wood fiber, and competitiveness of timber suppliers outside the Tongass National Forest. The historic timber industry employment in Southeast Alaska is shown in Figure 3-5.

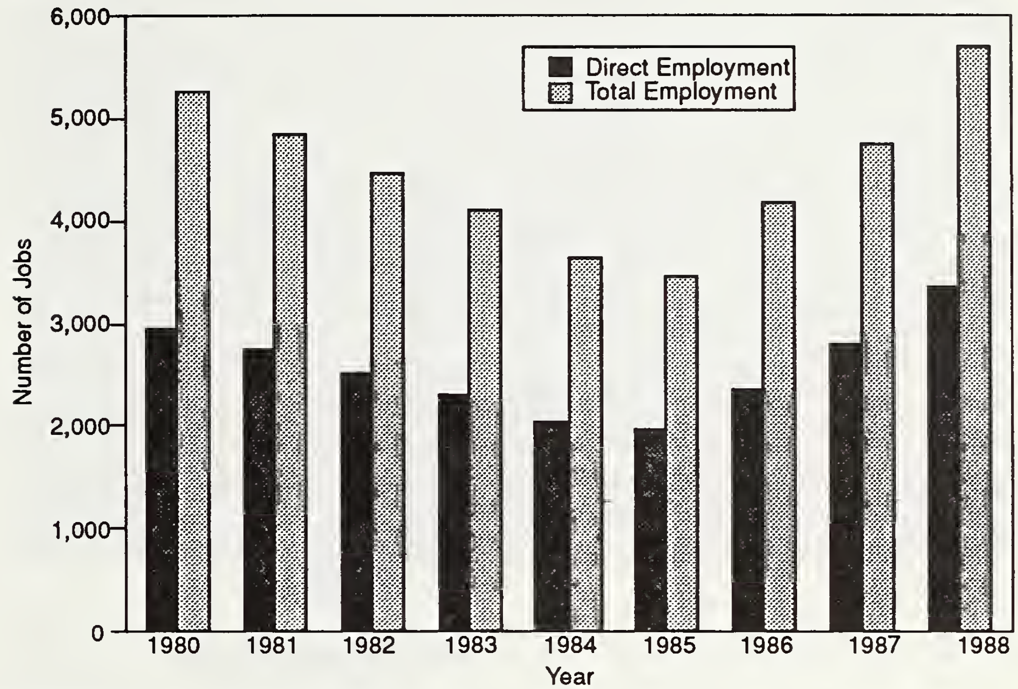
Commercial Fishing Industry

Although the commercial fisheries industry in Southeast Alaska continues to fluctuate, it remains a major component of the economy. Salmon stocks recovered from their low levels in the early 1970s and dominates the industry in the volume and value of catch and in harvest-related employment. The labor force and employment associated with fishing is highly seasonal. In all of Southeast Alaska, commercial fishing alone employed 4,725 people in 1988 (Table 3-37).

The comparative volumes and value suggest that from one-half to two-thirds of the fish used by the fish processing industry are salmon. Assuming that employment in the industry (Table 3-37) is proportional to some combination of the values and volumes of fish processed, then from one-half to two-thirds of the industry's employment is dependent on salmon. National forest habitats produce salmon harvested in Southeast Alaska's fisheries. If habitat is proportional to ownership of timberland in Southeast Alaska, the Tongass National Forest would contribute up to 80 percent of the salmon harvest. This result assumes that hatchery-reared stock in the harvest is minor and the combined catch of hatchery stocks and wild stocks originating outside Southeast Alaska, and wild stocks reared on private or state lands total approximately 20 percent of the total harvest.

Figure 3-5

Timber Industry Employment in Southeast Alaska



SOURCE: Thomas, 1990.

Table 3-37

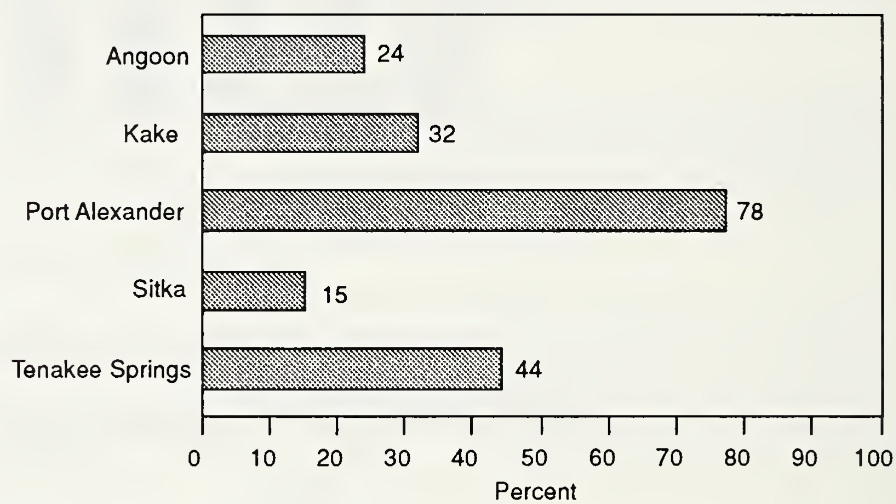
Fish Harvesting and Employment in Southeast Alaska

Year	Salmon Harvest (1,000 pounds)	Direct Employment (Jobs)	Total Employment (Jobs)
1980	93,027	3,475	4,700
1981	110,718	3,142	4,267
1982	122,991	3,332	4,507
1983	155,676	3,078	4,178
1984	154,846	3,277	4,452
1985	231,024	3,450	4,675
1986	214,997	3,500	4,750
1987	73,532	3,600	4,875
1988	90,696	3,500	4,725

SOURCE: Thomas, 1990.

Anadromous fish rearing habitat on the national forest lands in Southeast Alaska likely supports just under 1,850 jobs (or 55 percent of employment) in the commercial fishing/fish processing sectors. About 700 more employees in the retail, service, supply, and construction sectors depend on the business purchases and personal consumption expenditures of the fishermen and fish processors. With total wage and salary employment in the region averaging about $28,000 between 1980 and 1987, approximately 9 percent of the region's population depends on the harvest of salmon spawned on the national forest in Southeast Alaska. Individual communities may have a higher degree of dependence. In addition, for some families, commercial fishing and processing work provide an income supplement rather than their principal source of earnings. For other families, income from fishing or cannery work is the only cash supplement to an otherwise subsistence lifestyle. Figure 3-6 displays, for communities near the Project Area, the percentage of households by community that participate in commercial fishing and fish processing.

Figure 3-6
Percentage of Households Participating in Commercial Fishing and Fish Processing



SOURCE: Thomas, 1990.

NOTE: While some families live exclusively on earnings from commercial fishing, participation in commercial fishery does not exclude other forms of employment or sources of income. This results from the fact that some families have several people in the labor force and some workers hold two or more jobs often in different sectors.

Recreation and Tourism Industry

During the 1980s, tourism became a major industry in Southeast Alaska. Cruise ships traveled the Inside Passage making regular stops at Southeast ports in record numbers. Between 1980 and 1986, cruise ship passenger numbers increased by nearly 90 percent (Table 3-38). Total visitors to Southeast Alaska grew from 205,000 in 1983 to 350,000 in 1986. The tourist season also expanded to include much of May and September. Its economic significance is likely to increase.

Tug boat is docked at Baranof Warm Springs, a small community located just south of the Kelp Bay Project Area that supports tourism-related jobs.

Table 3-38
Recreation and Tourism for Southeast Alaska

Year	Southeast Cruiseship Passenger Numbers	Southeast Ferry System Use	Airline Passengers From Juneau	Misty Fiord Scenic Flight Passengers
1975	46,279	230,000	110,660	NA
1980	86,815	276,000	155,699	3,000
1981	83,566	282,000	156,257	6,300
1982	87,358	300,000	150,871	5,200
1983	99,706	308,000	167,302	5,300
1984	118,781	311,000	168,685	7,000
1985	137,005	313,000	163,837	12,000
1986	164,400	296,070	156,667	11,900
1987	202,000	326,644	157,952	12,200
1988	198,870	344,209	167,314	

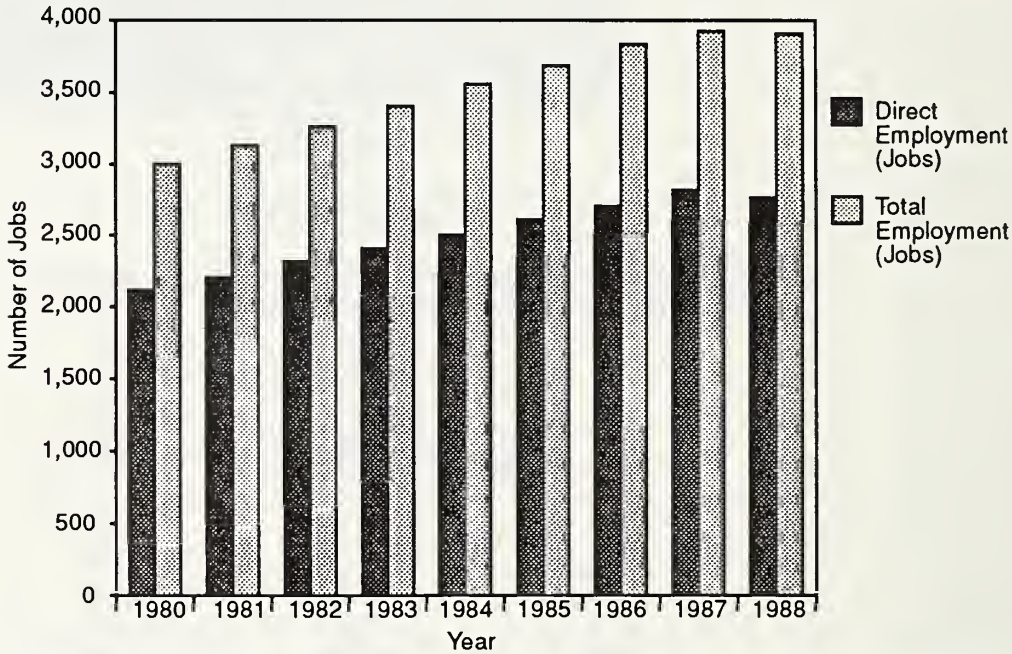
SOURCE: Thomas, 1990.

Marketing studies by the Alaska Division of Tourism indicate that "scenery, forest, mountains, out-of-doors" and "wilderness, unspoiled, rugged" were the top interests appealing to potential visitors (Forest Service, 1990a). Resident recreation also increased during the 1980s as indicated by increased fishing and hunting license sales.

Unlike other industries, the tourism and recreation industry is not a single industry, but a composite of many that serve more than tourists. For example, retail trade, service, and transportation serve tourists as well as local industries and residents. The labor force and employment associated with tourism and recreation are different than manufacturing because jobs tend to be highly seasonal and low paying.

Visitor accommodation and recreational expenditures by tourists and recreationists of Southeast Alaska supported about 2,700 jobs during the 1980s (Figure 3-7). The purchases made by Southeast Alaska businesses and the personal consumption of their employees supported another 1,160 employees. Together, tourism and recreational expenditures maintained approximately 14 percent of wage and salary employment in the region.

Figure 3-7
Recreation and Tourism Employment in Southeast Alaska



SOURCE: Thomas, 1990.

Currently, only one outfitter/guide permit holder uses the Project Area. There are, however, additional outfitter/guides without permits using the area. These outfitter/guides will be required to get permits after completion of an on-going analysis. Outfitters provide bear and deer hunting, photographing, stream and ocean fishing, hiking, dispersed camping, scenic viewing, study of flora and fauna, and general forest experiences. Mainly, they use Kelp Bay and the other bays and coves within the area, and the average trip lasts 7 to 10 days with 6 or 7 trips per season.

An estimated 285 jobs in Southeast Alaska depend on the expenditures made by hunters. About 820 jobs in the region result from the purchases of sport anglers. Another 475 jobs result from the purchases made by businesses and their employees. In total, hunting and fishing related expenditures produce approximately 6 percent of the region's wage and salary employment.

Hunter effort in the Project Area forms the basis for some of the expenditures that support jobs and personal earnings in Southeast Alaska. Table 3-39 summarizes information on deer hunting for specific communities near the Project Area. In 1988, the 998 hunter-days for deer recorded in the Project Area supported approximately 4 jobs that spread over the retail trade, services, and transportation sectors.

Table 3-39
Deer Hunting Expenditures by Community in 1985

Community	Percent Active Hunters	Hunter Days	Hunting Expenditures (Dollars)
Angoon	21	521	44,991
Kake	22	407	40,293
Port Alexander	12	64	2,290
Sitka	22	8,834	945,915
Tenakee Springs	28	358	9,891

SOURCE: Thomas, 1990.

Receipts and Payments

Table 3-40 shows the total receipts from the Tongass timber program and payments to the State of Alaska. With few exceptions, 25 percent of all monies received (including purchaser road credits) from the national forest is paid to the State of Alaska. The funds are used to benefit public schools and public roads. The amount of funds contributed in the past have not comprised a significant portion of the total public school and public road budgets for the cities and boroughs of Southeast Alaska.

Table 3-40
Forest Receipts and Payments to the State of Alaska, FY 1980-1988

Fiscal	Tongass Receipts[1]	Payments to Alaska
1980	26,024,494	6,506,124
1981	15,007,944	3,751,986
1982	21,622,764	5,405,691
1983	5,365,915	1,341,479
1984	4,063,189	1,015,797
1985	209,231	52,308
1986	1,967,240	491,810
1987[2]	-2,033,575	—
1988	1,232,672	308,168
1989	20,183,133	5,045,783
Total	93,643,007[3]	23,919,146

SOURCE: Thomas, 1990.

[1] Capital investments such as permanent roads, bridges, log transfer facilities, and timber stand improvements also contribute to the total assets of the Tongass National Foest, reduce future management costs, and are scheduled to achieve management objectives described in the Tongass Land Management Plan.

[2] The Tongass National Forest receipts for fiscal year 1987 were negative as a result of Comptroller General Decision B-224730 of March 31, 1987 to retroactively implement the emergency rate redeterminations for short-term sales. Without the reduction, Tongass National Forest receipts would have been positive by $2,139,943. As a result of the negative receipt, no payments to the State were made in 1987.

[3] Does not include receipts foregone as a result of the Federal Timber Contract Payment Modification Act. Estimated total value of affected contracts was approximately $54.5 million prior to the act if all volume were harvested. Total value of the affected contracts as a result of the act was approximately $1.2 million. The difference of $53.3 million represents receipts foregone, thus, the total Tongass receipts for the period fiscal years 1980-1988 would have been $126.8 million.

Subsistence

Many Southeast Alaska communities use the Tongass National Forest natural resources as a base or supplement to their livelihood. Subsistence activities include hunting for deer, seal, and bear; trapping furbearers; collecting berries, edible plants, and roots; digging clams; catching fish and gathering firewood. With passage of the Alaska National Interest Lands Conservation Act (ANILCA), Congress recognized the importance of subsistence resources to the rural communities of Alaska. Alaska National Interest Lands Conservation Act, 16 USC 3113, defines subsistence as:

"The customary and traditional uses by rural Alaska residents of wild, renewable resources for direct personal or family consumption as food, shelter, fuel, clothing, tools, or transportation; for the making and selling of handicraft articles out of nonedible byproducts of fish and wildlife resources taken for personal or family consumption; and for customary trade."

Subsistence plays an important role for communities not only in gathering resources but sharing as well. Subsistence resources are shared between households within communities and households in other communities as well. Households whose members are unable to participate in the harvest of specific resources may depend on receiving products from other members of the community. Communities in different geographic locations have access to different subsistence resources. For example, Sitka has long been recognized for its herring roe and Yakutat for its ribboned seaweed and soap berries. Traditionally, families traveled back and forth to share subsistence products.

Average per capita income may indicate the importance of subsistence to a community (Table 3-40). Low average per capita income may indicate a greater dependence on subsistence gathering than in higher income communities. On the other hand, individuals with a higher income may be able to sustain a lifestyle of both subsistence and one which perishable goods are easily attained because of the higher income. Higher income does not deter an individual from gathering resources and sharing those with friends and family.

Two subsistence users collecting herring eggs with hemlock boughs. The natural resources of the Tongass National Forest provide a base or supplement to the livelihood of many modern subsistence users.

Even if a household can purchase all of its food needs, the act of gathering subsistence resources is an important cultural aspect in Southeast Alaska communities, and some traditional foods are not available through any other means than subsistence gathering. The occasions for gathering wild foods are often also social events. Historical patterns of movement, such as the annual cycle of dispersal into small family groups at summer fishing camps to larger gatherings at protected winter villages are also linked to the tradition of subsistence harvest.

Information from the Tongass Resource Use Cooperative Survey (TRUCS) identifies eleven communities which conduct susbistence gathering in the Kelp Bay area in one way or another. Those communities identified were Angoon, Pelican, Tenakee Springs, Petersburg, Port Alexander, Port Protection, Kake, Sitka, Klukwan, Wrangell, and Meyers Chuck. Subsistence activities included hunting for deer and seal, collecting berries, edible plants and roots, digging clams, and catching fish. Table 3-41 depicts demographic information and data on subsistence gathering in 1987 for the communities that use the Project Area.

Table 3-41
Demographic and Subsistence Gathering Data on Communities Identified as Using the Project Area

Community	Pop 1988	Average Per capita Income	Per Cap Total Harvest lbs	% Hhold Food Supply	Fish Harvest lbs	Game Harvest lbs	Other lbs
Angoon	639	$11,605	292	46	128	108	56
Kake	634	$15,902	160	20	84	63	13
Klukwan	132	$11,605	239	28	206	24	9
Meyers Chuck	30	$6,950	414	*	313	57	44
Pelican	238	$12,381	355	55	194	131	30
Petersburg	4,040	$19,743	203	30	121	64	18
Port Alexander	106	$5,959	306	65	169	116	21
Port Protection	57	$6,000	311	40	249	43	19
Sitka	8,041	$20,392	139	15	99	40	
Tenakee Springs	95	$12,129	343	*	188	142	13
Wrangell	2,836	$21,301	165	23	119	46	0

SOURCE: Edenshaw, 1991.
*Not Known

The communities travel both short and long distances from their residence for subsistence gathering. The majority or all of the communities have individuals who have hand or power trolling permits, own purse seiners, and fish for other finfish in Southeast Alaska. Kelp Bay is located in the central portion of the Panhandle and when fish openings occur, fishermen travel long distances from their homes to make those openings. Cosmos Cove and The Basin offer good anchorages in inclement weather, and those individuals traveling may take the time to hunt, fish, or dig clams. Other communities nearby may gather subsistence resources in Kelp Bay on a yearly or seasonal basis.

The beach fringe throughout the Project Area has been identified by the 11 communities as an area used for subsistence gathering. On TRUCS maps, the subsistence use area extends for several miles inland in some places. An important deer hunting area for Angoon and Petersburg residents stretches from the eastern side to the middle of Catherine Island.

Glacial River in the South Arm of Kelp Bay, Bourbon Creek located in the Middle Arm of Kelp Bay, Local Creek on the eastern side of Catherine Island, and Cosmos Creek in Cosmos Cove produce pink and chum salmon which are important subsistence resources. With the exception of Glacial River, the other creeks also produce coho salmon.

The following descriptions give an overview of the subsistence uses by each community when the TRUCS survey was taken in 1987. Since TRUCS was completed, there might be more or less communities which use the Project Area. There is considerable overlap of resource gathering in the Project Area.

Tenakee Springs

In pursuing traditional subsistence resources, Tenakee Springs residents hunt deer, bear, and seals; catch salmon and other finfish, collect shellfish; and trap furbearers. The annual harvest of subsistence resources was 343 pounds per capita in 1987, dominated by deer (39 percent), other finfish (24 percent), shellfish (17 percent), and salmon (14 percent). The TRUCS reported a mean per capita income of just over $12,129 in 1987. Tenakee Springs is approximately 36 miles by water from the Project Area.

Wrangell

Wrangell, located in the east-central portion of Southeast Alaska, is on the northern tip of Wrangell Island, about seven miles from the mouth of the Stikine River and approximately 136 miles by water from the Project Area.

Wrangell residents hunt deer, moose, bear, and waterfowl; fish for salmon, halibut, and other marine fish; and gather shellfish and berries. The annual harvest of subsistence resources was 165 pounds per capita in 1987, dominated by shellfish (25 percent), salmon (18 percent), and other finfish (26 percent). Subsistence at that time provided about 23 percent of the household food supply. Wrangell residents harvested approximately 5 percent of their total deer harvest for 1989 in the Project Area (Table 3-42).

Table 3-42
Use of the Project Area for Deer Hunting in 1989

Community	Total Kill 1989	Kill in Project Area WAAs 1989	Percent
Angoon	281	59	21%
Juneau	3,765	35	1%
Ketchikan	1,550	25	2%
Petersburg	1,096	184	17%
Port Alexander	64	2	3%
Sitka	3,658	165	5%
Wrangell	389	20	5%
Other Alaska	160	20	13%
Total	10,963	510	5%

SOURCE: ADF&G, 1989a.
Notes: Total number of deer killed expanded from deer hunter survey. The Project Area is 8 of the 12 VCUs that makeup the 3 WAAs that harvest data is reported from.

Angoon

Angoon residents harvest deer, salmon, other fish, waterfowl, and shellfish among other resources. The annual harvest of subsistence resources was 292 pounds per capita in 1987, dominated by deer (30 percent), salmon (29 percent), other finfish (14 percent), and other mammals (14 percent). Subsistence provided 46 percent of the household food supply that year.

Angoon, the closest subsistence community to the Project Area, is only 12 miles by water, and the Project Area contributed 21 percent of Angoon's total deer harvest in 1989 (Table 3-42). Angoon residents also take salmon, halibut, shellfish, and seal from the Project Area.

Sitka

Sitka residents harvest a wide variety of resources including deer, bear, seal, waterfowl, furbearers, salmon, shellfish, and marine fish, among others. The annual harvest of subsistence resources was 139 pounds per capita in 1987, dominated by salmon (28 percent), deer (27 percent), other finfish (25 percent), and shellfish (16 percent). Subsistence provided about 15 percent of the household food that year.

Sitka is approximately 48 miles by water from the Project Area. The Project Area accounted for 5 percent of Sitka's total deer harvest in 1989 (Table 3-42).

Petersburg

Located in the east-central portion of Southeast Alaska, Petersburg is situated on the northwest shore of Mitkof Island, at the north end of Wrangell Narrows and approximately 100 miles by water from the Project Area.

Local subsistence resource use includes deer, bear, moose, salmon, other fish, waterfowl, clams, crabs, and berries. The annual harvest of those subsistence resources in 1987 was 203 pounds per capita, primarily for salmon (23 percent), other finfish (22 percent), and deer (22 percent). Approximately 30 percent of the household food supply was provided by subsistence resources. The Project Area accounted for 17 percent of Petersburg's total deer harvest in 1989 (Table 3-42).

Kake

Kake is located on northwestern Kupreanof Island approximately 44 miles by water from the Project Area. In pursuing traditional subsistence resources, Kake residents hunt deer, seal, bear, grouse, and waterfowl; trap furbearers; and gather shellfish, berries, and seaweed. The annual harvest of the above resources was 160 pounds per household in 1987, dominated by deer (24 percent), salmon (22 percent), and other finfish (21 percent). Subsistence provided just over 20 percent of the household food supply that year.

Port Protection

Port Protection subsistence gathering contributed to 40 percent of the household food supply, placing that community as one that heavily relies on the land. Residents harvested 311 pounds per capita of subsistence resources, again, dominated by salmon (36 percent), and other finfish (29 percent), and supplemented by shellfish (15 percent), and deer (13 percent) in the 1987 calender year. Port Protection is approximately 92 miles by water from the Project Area.

Port Alexander

Port Alexander is located on the east side of Baranof Island, about 65 miles south of Sitka, and 72 miles by water south of the Project Area.

The residents of Port Alexander use a variety of resources including deer, mountain goats, bear, waterfowl, trout, salmon, other marine fish, clams, crabs, and berries. The annual harvest of subsistence resources was about 306 pounds per capita in 1987. Subsistence provided almost 65 percent of the household supply that year. The community as a whole is seasonal, not all of its residents live on the island on a yearly basis.

Pelican

The community of Pelican is located on Lisianski Inlet on the northwest side of Chichagof Island approximately 96 miles by water from the Project Area. Pelican residents hunt deer, bear, waterfowl; trap furbearers; catch salmon and other marine finfish; and gather shellfish, herring eggs, plants and berries. The annual harvest of subsistence resources in 1987 was 355 pounds per capita. Subsistence provided over 55 percent of the households food supply.

Klukwan

Klukwan is a Chilkat Indian village located next to the Chilkat River, about 22 miles north of Haines and 148 miles by water north of the Project Area. In pursuing traditional subsistence customs, residents of Klukwan hunt moose, deer, black bear, mountain goats, seals, grouse, and waterfowl; fish for salmon, eulachon, and other fish; and gather clams and berries. The annual harvest of subsistence resources in 1987 was about 239 pounds per capita. That amount contributed to 28 percent of the food for the household.

Meyers Chuck

Meyers Chuck is located forty miles northwest of Ketchikan on Clarence Strait and approximately 160 miles by water south of the Project Area. The annual harvest of subsistence resources was 414 pounds per capita in 1987 for residents of Meyers Chuck. Average per capita income for this community of 30 was only $6,950 in 1987.

Chapter 4

Environmental Consequences

Chapter 4

Environmental Consequences

Introduction

This chapter provides the scientific and analytic basis for the comparison of alternatives presented in Chapter 2. It presents the expected effects on the physical, biological, social, and economic environments associated with implementation of the alternatives. All significant or potentially significant environmental consequences are disclosed, including the direct, indirect, and cumulative effects. These effects may have consequences that are both beneficial and detrimental. Effects are quantified where possible, although qualitative discussions are often necessary.

Chapter 4 begins by detailing the environmental consequences of the alternatives by the same categories used in the description of the affected environment in Chapter 3 (i.e., timber, wildlife, economic and social, etc.). Within each category, the direct, indirect, and cumulative effects are disclosed. Direct environmental effects are defined as those occurring at the same time and place as the initial cause or action. For the purposes of this document, the time period over which the direct effects are expected to occur is 1992 through approximately 1995. Indirect effects are those that occur later in time or are spatially removed from the activity but would be considered significant in the foreseeable future. Cumulative effects result from the incremental effects of actions when added to other past, present, and reasonably foreseeable future actions, regardless of what agency (Federal or non-Federal) or person undertakes such other actions. Cumulative effects can result from individually minor but collectively significant actions taking place over a period of time.

In the Memorandum of Order from *Tenakee Springs v. Courtright*, the District Court indicated that "the EIS should consider, to the extent of foreseeability, the cumulative impacts on the natural environment of a steadily expanding network of logging roads and cutting units." The reasonably foreseeable time frame over which both indirect and cumulative effects are estimated is here interpreted to mean until the end of the APC long-term contract (i.e., the year 2011). This determination of reasonably foreseeable is based on the Life of Sale Plan for the APC contract (Forest Service, 1982b) and was used for the Final Supplement to the EISs for the 1981 to 1986 and 1986 to 1990 operating periods (Forest Service, 1989c).

The cumulative effects analysis in this document considers the Tongass Land Management Plan (TLMP) and Amendment (Forest Service, 1979a; Forest Service, 1986a), and the Life of Sale Plan (Forest Service, 1982b). The Life of Sale Plan uses the timber output schedule in the TLMP to project the volume range to be harvested in each operating period through the end of the APC contract. The alternatives considered in this Draft EIS present various site-specific means of achieving part of the schedule developed in the Life of Sale Plan. As a

result, the cumulative effects do not depend entirely on the alternatives presented in this Draft EIS. Rather, they include what may be expected under the direction detailed in the TLMP and the Life of Sale Plan. The decisions made in the Forest Plan provide long-range direction for management of the Tongass National Forest for the duration of the plan. It is important to remember that national forest plans are reviewed periodically and revised at least every 10 to 15 years.

The cumulative effects would occur under any of the action alternatives until such time as the TLMP is revised. Decisions made during the revision process can provide for significant changes in management emphasis in any given portion of the national forest.

The following assumptions were made to assess the reasonably foreseeable effects to the year 2011. These assumptions reflect current management/technology of national forests and provide a uniform approach to estimating effects of timber harvest and road construction.

- Laws, guidelines, and Best Management Practices (BMPs) for resource protection would be followed. These requirements are expected to be at least as stringent in the future as they are today.
- Timber sale planning would occur in an interdisciplinary fashion.
- All acres of suitable commercial forest land are equally subject to impacts.
- The No-action Alternative would represent only a delay in implementing the TLMP and, based on volume projections in the Life of Sale Plan, foreseeable cumulative effects would begin to occur before 2011.
- Future effects on resources from timber harvest and road construction will be similar to impacts projected for current alternatives.

Chapter 4 concludes with other environmental considerations that must be addressed under NEPA but do not fall under the categories discussed in Chapter 3. These topics include unavoidable adverse environmental effects; the relationship between short-term uses and the maintenance and enhancement of long-term productivity; the irreversible and irretrievable commitments of resources; possible conflicts between the proposed action and the plans of other jurisdictions; and other environmental considerations.

Timber and Other Vegetation

Direct Effects

Timber Harvested

Prior to development of proposed harvest units and associated roads, design criteria were developed by the Interdisciplinary Team (Appendix C). These design criteria were developed to minimize potential impacts to all resources and were followed during preliminary harvest unit and road development, evaluation of these proposed harvest units and roads, and final unit and road design. Following are discussions of the acres of forested land harvested, the effects of silvicultural systems and timber harvest methods on the productivity of commercial forest land, and economic considerations (timber economics). Also included is a

Workers setting chokers on logs.

discussion of the proportion of Volume Class 6 proposed for harvest by alternative. The effects of timber harvest on mature and overmature stands is considered long-term and is discussed under *Long-Term Productivity*, later in this section.

Tables 4-1a through 4-1d show the acres proposed for harvest in each action alternative and the total percent of tentatively suitable, commercial forest land (CFL), and land area harvested, by VCU, by the end of this project. All units proposed for harvest have been determined to be suitable acres (Forest Service, 1987). Because Alternative 1 proposes no timber harvest and thus no timber would be cut, it is not displayed.

Table 4-1a

Acres of Forested Land Harvested, by VCU, For Alternative 2

				1995 Percent Harvested		
VCU	Past Harvest	Proposed Harvest	Total Harvest (1995)	Tentatively Suitable	CFL	Land Area
293	1,409	718	2,127	35	31	16
294	685	946	1,631	23	18	7
295	0	0	0	0	0	0
296	953	1,180	2,133	30	26	13
297	763	849	1,612	22	19	10
298	481	805	1,286	35	21	5
314	99	73	172	6	4	<1
315	565	523	1,088	26	20	13
Totals	4,955	5,094	10,049	26	21	7

SOURCE: Zaborske, 1991b.

Table 4-1b

Acres of Forested Land Harvested, by VCU, For Alternative 3

VCU	Past Harvest	Proposed Harvest	Total Harvest (1995)	1995 Percent Harvested: Tentatively Suitable	CFL	Land Area
293	1,409	1,294	2,703	45	40	20
294	685	1,852	2,537	36	28	11
295	0	0	0	0	0	0
296	953	395	1,348	19	16	9
297	763	925	1,688	23	20	11
298	481	71	552	15	9	2
314	99	0	99	3	2	<1
315	565	0	565	13	11	7
Totals	4,955	4,537	9,492	25	20	6

SOURCE: Zaborske, 1991.

Table 4-1c

Acres of Forested Land Harvested, by VCU, For Alternative 4

VCU	Past Harvest	Proposed Harvest	Total Harvest (1995)	1995 Percent Harvested: Tentatively Suitable	CFL	Land Area
293	1,409	699	2,108	35	31	15
294	685	880	1,565	22	17	7
295	0	0	0	0	0	0
296	953	487	1,440	20	17	9
297	763	582	1,345	19	16	9
298	481	312	793	22	13	3
314	99	25	124	4	3	<1
315	565	306	871	20	16	10
Totals	4,955	3,291	8,246	22	17	5

SOURCE: Zaborske, 1991b.

Table 4-1d
Acres of Forested Land Harvested, by VCU, For Alternative 5

VCU	Past Harvest	Proposed Harvest	Total Harvest (1995)	1995 Percent Harvested Tentatively Suitable	CFL	Land Area
293	1,409	1,580	2,989	49	44	22
294	685	2,029	2,714	38	30	11
295	0	0	0	0	0	0
296	953	958	1,911	27	23	12
297	763	1,460	2,223	31	27	14
298	481	1,051	1,532	42	26	5
314	99	531	630	22	14	2
315	565	810	1,375	32	26	16
Totals	4,955	8,419	13,374	35	28	9

SOURCE: Zaborske, 1991b.

Alternative 5 proposes to harvest the highest number of acres (8,419 acres), followed by Alternative 2 (5,094 acres), Alternative 3 (4,537 acres) and Alternative 4 (3,291 acres). Alternative 1 proposes no harvest and thus would not increase the number of acres harvested. When including past harvest, Alternative 5 would harvest 35 percent of the tentatively suitable forest land and completes the first timber harvest entry (see Glossary for a definition of harvest entry) as defined in the current Forest Plan. Alternatives 2 and 3 would harvest almost the same percentage of tentatively suitable forest land (including past harvest)--26 and 25 percent, respectively. Alternative 4 would harvest the least percentage of tentatively suitable forest land of all action alternatives, when including past harvest, 22 percent. Because Alternatives 2, 3, and 4 harvest less than one-third of the tentatively suitable forest land, they do not complete the first timber harvest entry as defined in the current Forest Plan. Even though Alternative 5 proposes to harvest 3,325 acres more than Alternative 2, 3,882 acres more than Alternative 3, and 5,128 acres more than Alternative 4, the difference in total land area harvested, including past harvest activities, between all action alternatives is less than 4 percent.

Proposed Harvest by Site Class

Because some site classes are more productive than others, they are rated by a site index and are assigned a site class of low, medium, or high. The site index is based on the expected height to which a tree will grow on that site within a given number of years (in this case, 100 years). On low sites, trees would be expected to grow between 50 and 69 feet in 100 years. On medium sites, trees would be expected to grow between 70 and 89 feet in 100 years and on high sites, trees would be expected to grow more than 90 feet in 100 years. In general, more timber can be grown at less cost on a high site than on a medium or low site, and more timber can be grown at less cost on a medium site than on a low site (Davis, 1966). Thus, from an economic standpoint and with all other resource considerations being equal, it makes

more sense to harvest high and medium sites rather than low sites; high sites are inherently more productive. However, by mixing high, medium, and low sites, average logging costs for low sites can be reduced; thus, more land can come under timber management. Tables 4-2a through 4-2d display the acres of proposed harvest by site class and by alternative. Since Alternative 1 does not propose any timber harvest at this time and no acres would be cut, it is not displayed.

Table 4-2a
Acres of Proposed Harvest by Site Class for Alternative 2

VCU	Site Class Low	Site Class Medium	Site Class High	VCU Total
293	235	436	47	718
294	81	616	249	946
295	0	0	0	0
296	303	610	267	1,180
297	139	581	129	849
298	200	509	96	805
314	0	73	0	73
315	164	286	73	523
Totals	1,122	3,111	861	5,094
Percent of Acres Harvested	22	61	17	100

SOURCE: Zaborske, 1991b.

Table 4-2b
Acres of Proposed Harvest by Site Class for Alternative 3

VCU	Low	Site Class Medium	High	VCU Total
293	313	818	163	1,294
294	227	1,151	474	1,852
295	0	0	0	0
296	14	217	164	395
297	256	502	167	925
298	19	52	0	71
314	0	0	0	0
315	0	0	0	0
Totals	829	2,740	968	4537
Percent of Acres Harvested	19	60	21	100

SOURCE: Zaborske, 1991b.

Table 4-2c
Acres of Proposed Harvest by Site Class for Alternative 4

VCU	Low	Site Class Medium	High	VCU Total
293	235	433	31	699
294	65	651	164	880
295	0	0	0	0
296	184	179	124	487
297	236	206	140	582
298	48	259	5	312
314	0	25	0	25
315	148	127	31	306
Totals	916	1,880	495	3,291
Percent of Acres Harvested	28	57	15	100

SOURCE: Zaborske, 1991b.

Table 4-2d

Acres of Proposed Harvest by Site Class for Alternative 5

VCU	Low	Site Class Medium	High	VCU Total
293	250	1,126	204	1,580
294	376	1,077	576	2,029
295	0	0	0	0
296	96	683	179	958
297	324	795	341	1,460
298	195	688	168	1,051
314	35	388	108	531
315	164	431	215	810
Totals	1440	5188	1791	8419
Percent of Acres Harvested	17	62	21	100

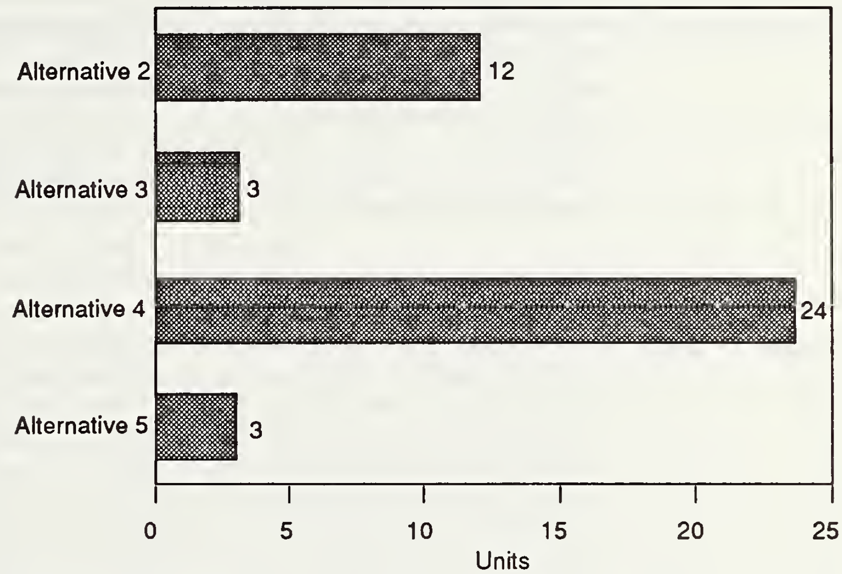
SOURCE: Zaborske, 1991.

Alternative 5 proposes to bring the highest number of acres in medium and high site classes under management (6,979 acres or 83 percent of the acres proposed for harvest). Alternative 2 proposes to bring the second highest number of acres in medium and high site classes under management (3,972 acres, or 78 percent, of the acres proposed for harvest), followed by Alternative 3 (3,708 acres, or 82 percent, of the acres proposed for harvest) and Alternative 4 (2,375 acres, or 72 percent, of the acres proposed for harvest). Since Alternative 1 proposes no timber harvest at this time, it provides no opportunity to bring medium and high sites under management.

Silvicultural Systems

Both even and uneven aged management (see Glossary) are approved for use in the Kelp Bay Project Area depending upon specific resource needs (Forest Service, 1983). Clearcutting, an even-aged silvicultural system, is recommended as the basic silvicultural system for hemlock-spruce forests. It leads to adequate natural regeneration, is economical, and is appropriate for old-growth stands with large and often defective timber. Clearcutting allows more solar radiation to reach the forest floor and thus increases biological decomposition of heavy organic accumulations, which improves the productivity of the site (Ruth and Harris, 1979). Uneven aged systems, or partial cutting, in the form of small group selection, will be used in areas to meet specific needs for other resources such as visual, wildlife, or recreation. Based on experience, logging costs for partial cutting can be 20 percent to 50 percent higher than costs for clearcutting. However, by using this silvicultural system, harvest units which may be unacceptable for clearcutting due to other resource concerns may be partially harvested. In addition, partial cuts may be used to enhance other resources, such as wildlife. Figure 4-1 displays the number of units that are proposed for partial cutting in each action alternative. See Appendix H for the specific unit numbers of partial cut units. Since Alternative 1 proposes no timber harvest and no timber would be cut, it is not displayed.

Figure 4-1
Number of Proposed Partial Cut Harvest Units, by Alternative



SOURCE: Zaborske, 1991b.

It should be noted that concepts developed under New Perspectives (see Chapter 2) have been incorporated in every action alternative and were considered and used in final individual harvest unit and road design and selection of harvest units for the alternatives. Which tools will be used in which harvest unit will be determined at the time the detailed silvicultural prescription is written for each harvest unit.

Alternative 4 proposes the highest number of partial cut units (24). Alternative 2 proposes the second highest number of partial cut units (12), followed by Alternatives 3 and 5, which both propose 3 partial cut units.

Harvest Methods

Yarding is the process of conveying logs from the stump to a landing. This can be done using ground-based equipment, cable logging systems, or helicopters. The method used depends upon many factors including access, topography, slope, and resource protection needs.

Moist and soft soils along with steep slopes in the Kelp Bay Project Area are difficult for operation of ground-based equipment, and except for shovel logging with track-mounted log loaders, there has been little opportunity for use of this type of equipment. Shovel logging is the process of moving logs with the boom of a hydraulic log loader. The object is to use the swing boom motion of the loader to swing logs into windrows, then swing the windrows to new locations, ultimately to a road or landing. Because shovel yarding is generally limited to slopes less than 20 percent, portions of proposed harvest units may be suited for shovel yarding but are proposed for cable yarding. This distinction is made at the time of harvest

unit layout. Thus, acreages of shovel yarding displayed may be less than the amount actually done during implementation; some acres proposed for cable yarding would actually be shovel yarded.

The effect of shovel logging is related to compaction of the soil under the track system and through loss of flotation, resulting in sinkage of the machine into the soil. The impact on the soil depends on the soil type and moisture condition of the soil. Shovel logging results in problems in poorly drained soils with organic parent material. However, shovel logging will impact the soil less than cable methods in cases where the cable system is prone to rutting by log passage. Since by shovel logging, logs are lifted slowly, picked up, and laid down again, no rutting occurs. Where the machine moves over slash or deep organic accumulations, compaction may not be a factor.

Cable logging systems used include highlead, slackline, and skyline systems. Highlead slackline and running skyline systems can be used to yard logs both up and down hill; live skyline (flyer) systems are used for uphill yarding only. Logs yarded by highlead systems are generally dragged on the ground. Some lift to one end of the log is provided by the 90-foot towers commonly used with this method. Where highlead is done uphill, the drag corridors radiate down and away from the landing. Water moving down the slope is dispersed into the cut unit. Where highlead is done down slope, water tends to congregate as drag corridors converge at the landings. Slackline and skyline systems are able to lift one end of the logs or completely suspend the log. The impact of log movement with these systems is much reduced when compared to highlead. Convergence or divergence of drag corridors, as discussed with the highlead system, are similar with the slackline and skyline skid corridors. In downhill yarding situations where the average yarding distance is less than 500 feet, running skyline systems may be used in place of highlead systems.

Cable yarder pulling logs to a landing.

Helicopter yarding is relatively new to the Chatham Area. Logs are lifted off the ground and flown to landings. This yarding system causes the least amount of impact to the soil but has the highest yarding cost.

Tables 4-3a through 4-3d display the distribution of proposed yarding systems for the action alternatives by VCU. Because Alternative 1 proposes no timber harvest and no acres would be cut, it is not displayed.

Table 4-3a
Distribution of Proposed Harvest System, by VCU, for Alternative 2, in Acres

	Logging System					
VCU	High-lead	Live Skyline	Slack-line	Heli-copter	Shovel	VCU Total
293	289	271	158	0	0	718
294	226	401	79	240	0	946
295	0	0	0	0	0	0
296	192	253	343	392	0	1,180
297	495	213	141	0	0	849
298	175	24	0	606	0	805
314	0	0	0	73	0	73
315	131	142	84	166	0	523
Totals	1,508	1,304	805	1,477	0	5,094
Percent of Total	30	25	16	29	0	100

SOURCE: Zaborske, 1991b.

Table 4-3b
Distribution of Proposed Harvest System, by VCU, for Alternative 3, in Acres

VCU	High-lead	Live Skyline	Slack-line	Heli-copter	Shovel	VCU Total
	Logging System					
293	514	655	125	0	0	1,294
294	359	678	200	615		1,852
295	0	0	0	0	0	0
296	0	336	59	0	0	395
297	504	266	155	0	0	925
298	52	19	0	0	0	71
314	0	0	0	0	0	0
315	0	0	0	0	0	0
Totals	1,429	1,954	539	615	0	4,537
Percent of Total	31	43	12	14	0	100

SOURCE: Zaborske, 1991b.

Table 4-3c
Distribution of Proposed Harvest System, by VCU, for Alternative 4, in Acres

VCU	High-lead	Live Skyline	Slack-line	Heli-copter	Shovel	VCU Total
	Logging System					
293	245	329	125	0	0	699
294	216	303	79	282	0	880
295	0	0	0	0	0	0
296	0	194	43	250	0	487
297	291	230	61	0	0	582
298	128	24	0	160	0	312
314	0	0	0	25	0	25
315	0	0	0	306	0	306
Totals	880	1,080	308	1,023	0	3,291
Percent of Total	27	33	9	31	0	100

SOURCE: Zaborsk&e, 1991b.

Table 4-3d
Distribution of Proposed Harvest System, by VCU, for Alternative 5, in Acres

	Logging System					
VCU	High-lead	Live Skyline	Slack-line	Heli-copter	Shovel	VCU Total
293	547	835	95	103	0	1,580
294	359	827	200	595	48	2,029
295	0	0	0	0	0	0
296	281	439	233	0	5	958
297	778	577	105	0	0	1,460
298	204	29	63	755	0	1,051
314	358	0	42	131	0	531
315	247	363	110	90	0	810
Totals	2,774	3,070	848	1,674	53	8,419
Percent of Total	33	36	10	20	<1	100

SOURCE: Zaborske, 1991b.

Skyline systems (live skyline and slackline) are proposed for 41 to 55 percent of the acres; 27 to 33 percent of the acres are proposed for highlead systems; 14 to 31 percent of the acres are proposed for helicopter yarding. In all action alternatives, shovel yarding is proposed for less than 1 percent of the acres.

Proportion of Harvest by Volume Class

Tables 4-4a through 4-4d display the distribution of acres proposed for harvest in each action alternative, by Volume Class, along with the percent of acres harvested. Because Alternative 1 proposes no timber harvest and no acres would be cut, it is not displayed.

Table 4-4a
Distribution of Acres Proposed for Harvest by Volume Class, for Alternative 2

VCU	Volume Class 4 Acres Harvested	Volume Class 4 Percent of Acres Harvested	Volume Class 5 Acres Harvested	Volume Class 5 Percent of Acres Harvested	Volume Class 6 Acres Harvested	Volume Class 6 Percent of Acres Harvested
293	588	82	130	18	0	0
294	401	42	536	57	9	1
295	0	0	0	0	0	0
296	382	32	769	65	29	3
297	635	75	214	25	0	0
298	498	62	241	30	66	8
314	32	44	41	56	0	0
315	220	42	303	58	0	0
Total	2,756	54	2,234	44	104	2

SOURCE: Zaborske, 1991b.
Note: Volume Class 4 = 8 - 20 MBF/acre
Volume Class 5 = 20 - 30 MBF/acre
Volume Class 6 = 30 - 50 MBF/acre

Table 4-4b
Distribution of Acres Proposed for Harvest by Volume Class, for Alternative 3

VCU	Volume Class 4 Acres Harvested	Volume Class 4 Percent of Acres Harvested	Volume Class 5 Acres Harvested	Volume Class 5 Percent of Acres Harvested	Volume Class 6 Acres Harvested	Volume Class 6 Percent of Acres Harvested
293	913	71	381	29	0	0
294	852	46	988	53	12	1
295	0	0	0	0	0	0
296	67	17	328	83	0	0
297	515	56	396	43	14	1
298	39	55	32	45	0	0
314	0	0	0	0	0	0
315	0	0	0	0	0	0
Total	2,386	52	2,125	47	26	1

SOURCE: Zaborske, 1991b.

Table 4-4c
Distribution of Acres Proposed for Harvest by Volume Class, for Alternative 4

	Volume Class 4		Volume Class 5		Volume Class 6	
VCU	Acres Harvested	Percent of Acres Harvested	Acres Harvested	Percent of Acres Harvested	Acres Harvested	Percent of Acres Harvested
293	515	74	184	26	0	0
294	412	47	459	52	9	1
295	0	0	0	0	0	0
296	149	31	331	68	7	1
297	398	68	184	32	0	0
298	173	55	139	45	0	0
314	11	44	14	56	0	0
315	125	41	181	59	0	0
Total	1,783	54	1,492	45	16	1

SOURCE: Zaborske, 1991b.

Table 4-4d
Distribution of Acres Proposed for Harvest by Volume Class, for Alternative 5

	Volume Class 4		Volume Class 5		Volume Class 6	
VCU	Acres Harvested	Percent of Acres Harvested	Acres Harvested	Percent of Acres Harvested	Acres Harvested	Percent of Acres Harvested
293	1,162	74	418	26	0	0
294	931	46	1,068	53	30	1
295	0	0	0	0	0	0
296	79	8	828	87	51	5
297	925	63	521	36	14	1
298	634	60	291	28	126	12
314	230	43	301	57	0	0
315	287	36	512	63	11	1
Total	4,248	50	3,939	47	232	3

SOURCE: Zaborske, 1991b.

All action alternatives harvest more acres of Volume Class 4 than of Volume Class 5, ranging from 50 percent to 54 percent of the acres harvested. Of the acres harvested, 44 percent to 47 percent are Volume Class 5. Volume Class 6 harvest represents 3 percent or less for the action alternatives.

The Tongass Timber Reform Act of 1990 requires that Volume Classes 6 and 7 be harvested in proportion to the degree to which they occur in a management area (MA). In the Kelp Bay Project Area, there are three MAs. MA C-41 consists of VCUs 291, 292, 293, and 294. Of these four VCUs, only VCUs 293 and 294 are in the Kelp Bay Project Area. MA C-42 consists entirely of VCU 295, which is a LUD II (unavailable for timber harvest) and thus has no effect on proportionality calculations. The third MA is C-43 and consists of VCUs 296, 297, 298, 314, and 315, all of which occur in the Kelp Bay Project Area.

The calculations of proportion are based on the original TLMP database information updated with project level data. Tongass Timber Reform Act stream buffers and mandatory 330-foot bald eagle nest site buffers were removed from the base before calculating proportion because they are unavailable for timber harvest. In the Kelp Bay Project Area, there is no identified Volume Class 7, so this discussion will deal with Volume Class 6 only.

Tables 4-5 through 4-9 display the proportion of Volume Class 6 in the Kelp Bay Project Area, by MA, as of March 1, 1990 (the date the Notice of Intent was filed) and the proportion of Volume Class 6 that would be remaining should a particular alternative be implemented. The proportion of volume in Volume Class 6 actually increases in both management areas under all action alternatives. This can be expected considering that Alternative 2 proposes to harvest only 15 acres of Volume Class 6 (Table 4-5) and Alternative 5 proposes to harvest only 79 acres of Volume Class 6 (Table 4-8). Alternatives 3 and 4 propose no harvest of Volume Class 6. Almost all of the volume harvested is in Volume Classes 4 and 5; thus, after harvest, the percentage of total volume remaining in Volume Class 6 would increase. Consequently, the proportionality requirement of the law is met.

Main valley of Bourbon Creek. Streamside and bald eagle nest buffers, required by law, are removed from timber base before calculating proportion of volume classes harvested.

Table 4-5
Volume Class Proportionality in Alternative 2

Volume Class	Total Acres	Acres in Buffers	Remaining Available Acres	Adjusted Total[1]	Proposed Harvest Acres	Remaining Acres After Harvest
Management Area C-41						
4 and 5	28,274	1,143	27,131	27,139	1,664	25,475
6	520	125	395	387	0	387
Total	28,794	1,268	27,526	27,526	1,664	25,862
Volume Class 6 Proportionality[2]				0.014		0.015
Management Area C-43						
4 and 5	30,806	2,001	28,805	28,957	3,415	25,542
6	952	104	848	696	15	681
Total	31,758	2,105	29,653	29,653	3,430	26,223
Volume Class 6 Proportionality[2]				0.023		0.026

SOURCE: Zaborske, 1991.

[1] Adjusted totals reflect updates with project level data.
[2] Proportionality is the acres of Volume Class 6 divided by the total acres.

Table 4-6
Volume Class Proportionality in Alternative 3

Volume Class	Total Acres	Acres in Buffers	Remaining Available Acres	Adjusted Total	Proposed Harvest Acres	Remaining Acres After Harvest
Management Area C-41						
4 and 5	28,274	1,143	27,131	27,141	3,146	23,995
6	520	125	395	385	0	385
Total	28,794	1,268	27,526	27,526	3,146	24,380
Volume Class 6 Proportionality				0.014		0.016
Management Area C-43						
4 and 5	30,806	2,001	28,805	28,819	1,391	27,428
6	952	104	848	834	0	834
Total	31,758	2,105	29,653	29,653	1,391	28,262
Volume Class 6 Proportionality				0.028		0.030

Table 4-7
Volume Class Proportionality in Alternative 4

Volume Class	Remaining Total Acres	Acres in Buffers	Proposed Available Acres	Adjusted Total	Harvest Acres	Remaining Acres After Harvest
Management Area C-41						
4 and 5	28,274	1,143	27,131	27,140	1,579	25,561
6	520	125	395	386	0	386
Total	28,794	1,268	27,526	27,526	1,579	25,947
Volume Class 6 Proportionality				0.014		0.015
Management Area C-43						
4 and 5	30,806	2,001	28,805	28,805	1,712	27,093
6	952	104	848	848	0	838
Total	31,758	2,105	29,653	29,653	1,712	27,941
Volume Class 6 Proportionality				0.029		0.030

Table 4-8
Volume Class Proportionality in Alternative 5

Volume Class	Total Acres	Acres in Buffers	Remaining Available Acres	Adjusted Total	Proposed Harvest Acres	Remaining Acres After Harvest
Management Area C-41						
4 and 5	28,274	1,143	27,131	27,112	3,561	25,551
6	520	125	395	414	48	366
Total	28,794	1,268	27,526	27,526	3,609	23,917
Volume Class 6 Proportionality				0.015		0.015
Management Area C-43						
4 and 5	30,806	2,001	28,805	29,075	4,779	24,296
6	952	104	848	578	31	547
Total	31,758	2,105	29,653	29,653	4,810	24,843
Volume Class 6 Proportionality				0.019		0.022

Timber Economics

Current Forest Service Handbook direction (Forest Service [F]) requires an economic efficiency analysis to compare benefits and costs of a project. This handbook also directs that timber harvest projects provide at least 60 percent of normal profit, which must be included when calculating costs.

This economic efficiency analysis is performed by comparing expected gross revenues to estimated costs and arriving at an estimate of net revenues. In order to account for market fluctuations, weighted average timber values over the past 10 years are used in the analysis.

Stump to truck logging costs vary by Volume Class (indices of the average volume of timber per acre) mainly due to the size of the logs yarded. In general, the higher the volume per acre, the larger the logs; thus, the logging costs per thousand board feet (MBF) are lower. Pond value is the value of the logs at the mill, minus manufacturing costs. Table 4-9 displays estimated stump to truck logging costs and pond values by Volume Class. The stump to truck logging costs include 60 percent of normal profit, felling and bucking, skidding, loading, depreciation, haul, raft and tow, overhead, and administration costs.

Table 4-9
Summary of Stump to Truck Logging Costs and Pond Values by Volume Class ($/MBF)

	Logging System					
Volume Class	High-lead	Live Skyline	Slack-line	Heli-copter	Shovel	Pond Value
4	$174.26	$143.46	$185.97	$234.24	$270.78	$328.31
5	$100.22	$ 84.47	$104.35	$197.08	$150.52	$286.20
6	$ 73.41	$ 65.44	$ 81.17	$186.25	$134.36	$258.15

SOURCE: Zaborske, 1991b.

In addition to logging costs, costs related to specified road construction and reconstruction, temporary road construction, LTF construction, camp development, and camp mobilization costs need to be factored in when determining the economics of timber sales. Table 4-10 summarizes these costs by alternative. Because Alternative 1 proposes no timber harvest and no timber would be cut, it is not displayed. Road construction costs are $142,000 per mile; road reconstruction costs are $20,000 per mile; and temporary road construction costs are $70,000 per mile (Costa, 1991).

Table 4-10
Summary of Road, LTF, Camp Development and Camp Mobilization Costs (Millions of Dollars)

Alt.	Road Costs	LTF Construction Costs	Camp Mobilization Costs	Total Costs
2	$11.18	$1.08	$0.42	$12.68
3	$ 8.08	$0.48	$0.30	$ 8.86
4	$ 9.11	$1.08	$0.42	$10.61
5	$13.97	$1.32	$0.46	$15.75

SOURCE: Costa, 1991.

Estimated net timber value is arrived at by subtracting all associated logging costs from the pond value for all proposed harvest units in each action alternative. Thus, individual units which may be uneconomical to harvest by themselves would be offset by other units which are economical to harvest. This would result in less productive lands or lands where the timber is highly defective coming under management, thus increasing future timber yields. It is considered appropriate to rank the alternatives in order by net value rather than measuring the degree of value because these volumes and timber values are estimates based upon current information and not actual appraisal values or cruised timber volumes. Net values are shown rounded to the nearest $10 since the appraisal figures are based on our best estimates. Table 4-11 displays the estimated value and ranking of each alternative based upon the net value. Because Alternative 1 has no timber harvest costs or values, it is given a null value and ranking. Prior to the time the timber is made available to APC, a timber cruise and appraisal will be performed, using current costs and selling values, to determine the volume and value of the timber on the acreage made available to APC.

Table 4-11

Summary of Estimated Values by Alternative ($/MBF) (Negative Values are Shown in Parentheses)

Alternative	Estimated Total Volume Harvested (MBF)	Estimated Net Value ($/MBF)	Rank
1	0	$0	Null
2	136,209	$20	3
3	121,073	$40	1
4	86,355	$30	4
5	229,739	$40	2

SOURCE: Zaborske, 1991b.

From an economic standpoint, Alternative 3 appears slightly better than Alternative 5. Alternative 2 has about half the net value of Alternatives 3 or 5. Alternative 4 would not be an economic offering as currently designed. Since Alternative 1 proposes no timber harvest, it has a null value and thus no ranking.

Harvest by Plant Series

Timber harvest activities would affect forested plant communities but would have little or no effect on non-forest plant communities, with the exception of short road segments which may cross non-forested areas. The short-term effect on vegetation in the Kelp Bay Project Area resulting from timber harvest activity would be the conversion of climax forest stands into younger, faster-growing successional stands. The removal of the forest overstory would change the microsite conditions that had influenced the species composition and density of the understory vegetation. Species that thrive best in the shaded and protected environment under the mature forest (such as some mosses, lichens, herbs, and shrubs) would find themselves without the beneficial influence of the trees and would be reduced in vigor or

competitive ability. Some species survive in the understory but, when released from the influence of the forest, become vigorous competitors for growth space. Examples of such species include huckleberries, salmonberry, and western hemlock trees. Other species are not notable in the forest understory (such as Sitka spruce) but are able to develop rapidly from seed in open conditions. Tables 4-12a through 4-12d show the acres of proposed harvest for each major plant series found in the Kelp Bay Project Area, by alternative. Because Alternative 1 does not propose any harvest at this time, it is not displayed as no acres would be cut. Refer to the *Timber and Other Vegetation* section of Chapter 3 for a description of these plant series.

Table 4-12a

Acres of Proposed Harvest by Major Plant Series for Alternative 2

	Plant Series				
VCU	Western Hemlock	Sitka Spruce	Mixed Conifer	Mountain Hemlock	VCU Total
293	509	0	199	10	718
294	820	10	97	19	946
295	0	0	0	0	0
296	1,107	0	6	67	1,180
297	647	0	129	73	849
298	677	15	99	14	805
314	46	0	27	0	73
315	422	27	61	13	523
Totals	4,228	52	618	196	5,094
Percent of Acres Harvested	83	1	12	4	100

SOURCE: Zaborske, 1991.

Table 4-12b
Acres of Proposed Harvest by Major Plant Series for Alternative 3

VCU	Western Hemlock	Sitka Spruce	Plant Series Mixed Conifer	Mountain Hemlock	VCU Total
293	1,007	0	214	73	1,294
294	1,646	10	141	55	1,852
295	0	0	0	0	0
296	377	0	0	18	395
297	766	0	101	58	925
298	59	0	0	12	71
314	0	0	0	0	0
315	0	0	0	0	0
Totals	3,855	10	456	216	4,537
Percent of Acres Harvested	85	<1	10	5	100

SOURCE: Zaborske, 1991b.

Table 4-12c
Acres of Proposed Harvest by Major Plant Series for Alternative 4

VCU	Western Hemlock	Sitka Spruce	Plant Series Mixed Conifer	Mountain Hemlock	VCU Total
293	520	0	169	10	699
294	744	10	107	19	880
295	0	0	0	0	0
296	469	0	0	18	487
297	409	0	107	66	582
298	229	0	69	14	312
314	25	0	0	0	25
315	240	7	46	13	306
Totals	2,636	17	498	140	3,291
Percent of Acres Harvested	80	1	15	4	100

SOURCE: Zaborske, 1991b.

Table 4-12d
Acres of Proposed Harvest by Major Plant Series for Alternative 5

			Plant Series		
VCU	Western Hemlock	Sitka Spruce	Mixed Conifer	Mountain Hemlock	VCU Total
293	1,287	0	212	81	1,580
294	1,764	54	113	98	2,029
295	0	0	0	0	0
296	938	5	7	8	958
297	1,182	0	218	60	1,460
298	865	44	106	36	1,051
314	436	49	34	12	531
315	695	27	75	13	810
Totals	7,167	179	765	308	8,419
Percent of Acres Harvested	85	2	9	4	100

SOURCE: Zaborske, 1991b.

Western hemlock is the most widely harvested plant series in all action alternatives, ranging in harvest from 2,636 acres to 7,167 acres. This would be expected; western hemlock is the most widely distributed plant series in the Kelp Bay Project Area (Table 3-6, Chapter 3). The harvest of mixed conifer series ranges from 456 acres to 765 acres, while the harvest of mountain hemlock series ranges from 140 acres to 308 acres. Sitka spruce is the least harvested plant series, ranging from 10 acres to 179 acres. Not only is this series the least widely distributed plant series in the Kelp Bay Project Area (Table 3-6, Chapter 3), this series also occurs mainly in riparian areas which generally have high value for other resources such as wildlife, fisheries, and recreation. Alternative 1 proposes no additional harvest; thus, there would be no additional conversion of climax forest stands to younger, faster-growing stands. The successional changes which occur in the forest after harvest are described in *Indirect and Cumulative Effects* beginning on the next page.

The overall effects of successional changes through 1995 would be negligible for Alternatives 2, 3 and 4 and minor for Alternative 5.

Threatened and Endangered Plant Species

No plant species known to occur in Alaska have been determined by the U.S. Fish and Wildlife Service to be threatened or endangered. Based on the surveys that have been taken and on the knowledge of the plants' habitats and ranges, it is highly unlikely that presently listed plants occur in the Kelp Bay Project Area. As a result, the proposed actions are not expected to affect threatened or endangered plant species. None are known to exist in the Kelp Bay Project Area.

Indirect and Cumulative Effects

Plant Succession

After reforestation, managed forests grow through several distinctive successional stages. The following discussion on successional changes that occur in the forest after harvest generally applies to all units proposed for harvest. Characteristics such as height, diameter, and productivity vary between sites of different quality (site classes). See Table 4-19 (Average Structural Characteristics of Managed Stands by Site Classification) for these differences between site classes. Different components dominate the stand at different stages, and the overall forest structure changes over time. These stages are described below.

In the first 5 years of the seedling-sapling understory colonization stage, the young stand receives maximum sunlight, resulting in the rapid establishment of a variety of shrubs, forbs, and grasses. There is little incidence of damage or mortality from disease or infestation at this stage. The changed structure of the young stand affects the structure of adjacent stands; windthrow increases with greater wind exposure, and understory development accelerates due to increased light into the stand (see Glossary for definitions).

In years 5 to 20, seedlings grow into a vigorous new forest of trees, averaging about 19 feet in height and 1 to 3 inches diameter at breast height (DBH). Understory production of woody-stemmed species is at its highest at this stage, especially in blueberry-dominated sites. Larger dead materials from the original stand begin to decompose, and the stand edge stabilizes, resulting in less windthrow.

At the end of this successional stage, the stand may be precommercially thinned, leaving a species composition of about 60 percent western hemlock, 40 percent Sitka spruce, and less than 2 percent cedar.

Table 4-13 tracks the cumulative acres in the understory colonization stage from the present (1990) to the end of the long-term contract (2011), by alternative. These figures represent the current condition, what is proposed for harvest at this time in each alternative, projected future harvest through 2011, and changes that occur over time as stands grow from one stage to the next.

Alternative 5 projects the highest number of acres in the understory colonization stage in 1995 (11,838 acres), followed by Alternative 2 (8,513 acres), Alternative 3 (7,956 acres), Alternative 4 (6,710 acres), and Alternative 1 projects the lowest number of acres in this successional stage (3,419 acres).

In 2011, Alternative 2 projects the highest number of acres in the understory colonization stage (10,426 acres), followed by Alternative 4 (10,121 acres), Alternative 1 (10,072 acres), Alternative 5 (10,056 acres each) and Alternative 3 (10,038 acres). The difference between all alternatives in this successional stage in 2011 is 388 acres.

At a stand age of 20 to 50 years, the dense, closed forest and understory exclusion stage tree growth is very rapid, with a gain of about 1 foot in height per year. At age 50, tree heights range from 48 to 72 feet and diameters range from 5 to 10 inches, depending on the site class. Tree crowns begin to grow closer together, while the understory changes from a dense shrub, herb, and seedling dominated structure to one of dense moss. Stands which have been precommercially thinned will have a two-layered canopy, with hemlock in the lower story. Canopy closure will occur more slowly in precommercially thinned sites.

Table 4-13
Cumulative Acres in Understory Colonization Stage, by Alternative

	Acres In	Alternative 1		2		3		4		5	
VCU	1990	1995	2,011	1,995	2011	1995	2011	1995	2011	1995	2011
293	1,410	0	1,551	718	1,539	1,294	1,294	699	1,751	1,580	1,580
294	685	0	1,944	946	1,975	1,852	1,852	880	2,198	2,029	2,029
295	67	67	0	67	0	67	0	67	0	67	0
296	1,011	1,011	1,259	2,191	1,847	1,406	1,451	1,498	1,341	1,969	1,272
297	763	763	1,863	1,612	1,835	1,688	2,482	1,345	1,845	2,223	1,924
298	490	490	1,219	1,295	1,450	561	1,083	802	1,138	1,541	1,352
314	512	512	1,088	585	649	512	908	537	763	1,043	801
315	576	576	1,148	1,099	1,131	576	968	882	1,085	1,386	1,098
Total	5,514	3,419	10,072	8,513	10,426	7,956	10,038	6,710	10,121	11838	10,056

SOURCE: Zaborske, 1991b.

In years 50 to 80, the stand remains closed. At age 80, tree heights range from 74 to 107 feet and diameters range from 8 to 13 inches, depending on site class. Little sunlight reaches the forest floor, and the understory continues to be dominated by moss. Tree diameter growth slows to about 1 inch every 10 years, as competition between trees increases. It is not currently economically feasible to thin stands at this age, but thinning would increase understory growth and diversity, and would also result in greater tree diameter growth.

Table 4-14 tracks the cumulative acres in the understory exclusion stage from the present (1990) to the end of the long-term contract (2011), by alternative. These figures represent the current condition and changes that occur over time as stands grow from one stage to the next.

Table 4-14
Cumulative Acres in Understory Exclusion Stage, by Alternative

VCU	Acres In 1990	Alt. 1 1995	Alt. 1 2011	Alt. 2 1995	Alt. 2 2011	Alt. 3 1995	Alt. 3 2011	Alt. 4 1995	Alt. 4 2011	Alt. 5 1995	Alt. 5 2011
293	0	1,410	1,410	1,410	1,410	1,410	1,410	1,410	1,410	1,410	1,410
294	0	658	658	658	658	658	658	658	658	658	658
295	8	8	75	8	75	8	75	8	75	8	75
296	30	30	1,041	30	1,041	30	1,041	30	1,041	30	1,041
297	9	9	745	9	745	9	745	9	745	9	745
298	0	0	490	0	490	0	490	0	490	0	490
314	9	9	521	9	521	9	521	9	521	9	521
315	7	7	583	7	583	7	583	7	583	7	583
Total	63	2,131	5,523	2,131	5,523	2,131	5,523	2,131	5,523	2,131	5,523

SOURCE: Zaborske, 1991.

As any proposed harvest would probably not begin until 1992 and is expected to be substantially complete in 1995, none of the acres proposed for harvest at this time would grow into this successional stage by 2011. The only change that occurs is the growth of some of the existing harvest units into the understory exclusion stage. Thus, all alternatives show the same number of total acres in this successional stage in both 1995 and 2011.

In years 80 to 100, the mature, even-aged forest and understory reinitiation stage, the stand becomes mature. At age 100, tree heights range from 88 to 123 feet and diameters range from 10 to 15 inches, depending on site class. Some trees may die, while others become clearly dominant in size. Diameter growth remains at less than 1 inch every 10 years. Moss continues to dominate the understory, except in places where the canopy has opened and allowed sufficient light for herbaceous plants. These structural characteristics continue into the later stages of the stand (100 to 160 years), with continued slow growth and occasional openings in the canopy (Forest Service, 1989b). Because none of the existing harvest units or proposed harvest units would grow into this successional stage by 2011, no acres are displayed. The number of acres in this successional stage would be close to the number presently existing in the Project Area and displayed in Chapter 3, Table 3-11. In addition to the above stages for managed stands, Alaback (1984) identified an old-growth stage which would pertain to stands managed for old-growth or stands which have not been harvested. The stand becomes overmature. Patches of shrubs, tree saplings, and herbs alternate with patches of overmature timber, creating a complex, multilayered mosaic. The stand declines in growth and vigor and has the highest degree of variation and the most structurally diverse understory of any successional stage. Table 4-15 presents the acres of old-growth that existed prior to the APC long-term timber contract and the acreages of old growth that are projected to remain at the end of this Project (1995) and at the end of the contract (2011), by alternative.

Table 4-15

Projected Acres of Old-Growth Remaining, by Alternative

	Acres	Alternative									
	In	1		2		3		4		5	
VCU	1990	1995	2,011	1,995	2011	1995	2011	1995	2011	1995	2011
293	7,052	5,643	4,092	4,925	4,104	4,349	4,349	4,944	3,892	4,063	4,063
294	9,408	8,723	6,779	7,777	6,748	6,871	6,871	7,843	6,525	6,694	6,694
295	4,384	4,384	4,384	4,384	4,384	4,384	4,384	4,384	4,384	4,384	4,384
296	8,551	7,598	6,339	6,418	5,751	7,203	6,147	7,111	6,257	6,640	6,326
297	9,099	8,336	6,473	7,487	6,501	7,411	5,854	7,754	6,491	6,876	6,412
298	6,383	5,902	4,683	5,097	4,452	5,831	4,819	5,590	4,764	4,851	4,550
314	4,758	4,659	3,571	4,586	4,010	4,659	3,751	4,634	3,896	4,128	3,858
315	5,512	4,947	3,799	4,424	3,816	4,947	3,979	4,641	3,862	4,137	3,849
Total	55,147	50,192	40,120	45,098	39,766	45,655	40,154	46,901	40,071	41,773	40,136
Percent of 1961 Acres		91	73	82	72	83	73	85	73	7673	

SOURCE: Zaborske, 1991b.

Alternative 1 projects the largest number of acres, 50,192 acres (91 percent) of the original amount, remaining in old growth in 1995; followed by Alternative 4 (46,901 acres or 85 percent of the original amount); Alternative 3 (45,655 acres or 83 percent of the original amount); and Alternative 2 (45,098 acres or 82 percent of the original amount. Alternative 5 projects the lowest number of acres remaining in old growth in 1995 (41,773 acres or 76 percent of the original amount).

In 2011, the difference in acres of old-growth remaining between all alternatives is 388, or less than 1 percent of the original amount. For all alternatives, 72 to 73 percent of the original amount of old-growth acres are projected to be remaining in the Kelp Bay Planning Area.

Regeneration

All of the areas proposed for harvest will be restocked within 5 years, either by managed natural regeneration or by replanting. Where necessary, precommercial thinning will be done approximately 20 years after harvest. VCUs 293, 294, 298, 314, and 315 (LUD IV VCUs) will be managed on a 100-year rotation while VCUs 296 and 297 (LUD III VCUs) will be managed on a 120-year rotation. No timber harvest is planned for VCU 295. Following are discussions of the effects of regeneration and precommercial thinning along with projected timber harvest through the year 2011 (end of the 50-year contract).

Old-growth forest. Conks visible on these overmature trees indicate their declining quality for commercial use.

The Forest Service is required by law, regulation, and policy to plan timber harvest only where there is assurance that such land can be regenerated within 5 years after harvest is completed. Current management prescriptions for harvest units in the Kelp Bay Project Area specify natural regeneration to restock most clearcut-harvested stands. Artificial regeneration by hand planting would serve as the back-up method for units that cannot be certified as adequately regenerated within 5 years after harvest, or for units where the silvicultural prescription calls for the planting of particular species to meet specific resource needs. Burning may be used to prepare sites for natural regeneration establishment. Some areas may also be broadcast burned if management direction and silvicultural prescriptions indicate a need to reduce fuel concentrations, or to meet other resource needs. Table 4-16 shows the number of acres identified for potential hand planting to either restock cutover areas or to ensure that the current species composition will carry over to the new stand. Since Alternative 1 proposes no timber harvest and no acres would be cut, there would not be any acres requiring hand planting. Thus, it is not displayed. It should be recognized that areas requiring planting cannot be accurately identified until after harvest when stocking surveys indicate inadequate natural regeneration. Thus, these acreage figures may change at the time hand planting would occur.

Table 4-16
Number of Acres Identified for Potential Hand Planting, by Alternative

	Alternative			
VCU	2	3	4	5
293	97	101	82	106
294	59	80	59	107
295	0	0	0	0
296	0	0	0	8
297	65	51	51	109
298	65	0	35	97
314	14	0	0	66
315	58	0	23	65
Totals	358	232	250	558

SOURCE: Zaborske, 1991b.

Thousands of little trees are visible in this clearcut. In a few years, this area will be ready for precommercial thinning. All areas proposed for harvest in the Project Area will be restocked by natural regeneration or by replanting.

Precommercial Thinning

Stocking on many upland sites can average 4,000 stems per acre. Although these stands may eventually thin naturally, production of usable wood would be hastened if stocking were less dense through the use of precommercial thinning (Harris and Farr, 1974). It is estimated that precommercially thinning one acre would permit an increase in one year's timber harvest of 5.4 MMBF (Forest Service, 1986a). Short-term benefits of precommercial thinning include employment; in addition, habitat quality for some wildlife species may be increased. Long-term benefits are primarily centered around reducing the competition for sunlight by the plant community. This results in the understory and the remaining conifers growing at accelerated rates for longer time periods than unthinned, second-growth stands. This translates into higher forage values to wildlife, higher sawlog volume, and faster successional change, thus providing climax stand conditions sooner than would be provided by unthinned second-growth stands (Forest Service, 1989b). Table 4-17 shows the number of acres that have been identified for potential precommercial thinning, by alternative. Because Alternative 1 proposes no timber harvest, there would be no acres in need of precommercial thinning due to timber harvest. Thus, it is not displayed. It should be recognized that precommercial thinning is performed approximately 20 years after harvest and is dependent upon site, stocking, and possibly other resource needs. Thus, these acreage figures may change at the time precommercial thinning is performed.

Table 4-17

Number of Acres Identified for Potential Precommercial Thinning, by Alternative

	Alternative			
VCU	2	3	4	5
293	47	163	31	204
294	237	449	115	516
295	0	0	0	0
296	253	164	82	174
297	112	167	123	341
298	76	0	0	142
314	0	0	0	108
315	73	0	20	215
Totals	798	943	371	1,700

SOURCE: Zaborske, 1991a.

Projected Harvest Through 2011

All alternatives considered project timber harvest in the Kelp Bay Project Area through 2011. However, future harvest units cannot be identified at this time. Rather, they will be determined in an interdisciplinary manner at the time future projects are proposed. Thus, it cannot be determined how many acres of each plant series would be proposed for future harvest. However, it could be reasonable to assume that the percentage of total acres harvested in future projects in each plant series would approximate the percentages in this project (Table 4-1, Acres of Forested Land Harvested, *Direct Effects* section).

The Multi-Entry Layout Process was used to project reasonably foreseeable harvest in the Life of Sale Plan. The purpose of determining a projected harvest through the year 2011 is to provide information by which to analyze reasonably foreseeable effects, rather than to begin planning actual harvest units. Harvest units through 2011 would be analyzed for site-specific impacts in planning efforts similar to this effort. Tables 4-18a through 4-18e display projected timber harvest through 2011, by alternative. Because Alternative 1 does not propose any harvest at this time, Cumulative Harvest in 1995 reflects past harvest activities that occurred prior to 1990.

Table 4-18a

Cumulative Effects of Timber Harvest by 2011 for Alternative 1, in Acres

VCU	Cumulative Harvest in 1995	Projected Harvest 1995-2011	Cumulative Harvest in 2011	Percent Harvested: Tentatively Suitable	Percent Harvested: CFL	Percent Harvested: Land Area
293	1,409	1,551	2,960	49	43	22
294	685	1,944	2,629	37	29	11
295	0	0	0	0	0	0
296	953	1,259	2,212	31	27	14
297	763	1,863	2,626	36	32	17
298	481	1,219	1,700	46	28	6
314	99	1,088	1,187	42	26	3
315	565	1,148	1,713	40	32	20
Totals	4,955	10,072	15,027	39	31	10

SOURCE: Zaborske, 1991b.

Table 4-18b

Cumulative Effects of Timber Harvest by 2011 for Alternative 2, in Acres

VCU	Cumulative Harvest in 1995	Projected Harvest 1995-2011	Cumulative Harvest in 2011	Percent Harvested Tentatively Suitable	Percent Harvested CFL	Percent Harvested Land Area
293	2,127	821	2,948	49	43	22
294	1,631	1,029	2,660	38	29	11
295	0	0	0	0	0	0
296	2,133	667	2,800	40	34	18
297	1,612	986	2,598	36	31	17
298	1,286	645	1,931	53	32	7
314	172	576	748	26	16	2
315	1,088	608	1,696	40	32	20
Totals	10,049	5,332	15,381	40	32	10

SOURCE: Zaborske, 1991b.

Table 4-18c

Cumulative Effects of Timber Harvest by 2011 for Alternative 3, in Acres

VCU	Cumulative Harvest in 1995	Projected Harvest 1995-2011	Cumulative Harvest in 2011	Percent Harvested Tentatively Suitable	Percent Harvested CFL	Percent Harvested Land Area
293	2,703	0	2,703	45	40	20
294	2,537	0	2,537	36	28	11
295	0	0	0	0	0	0
296	1,348	1,056	2,404	34	29	15
297	1,688	1,557	3,245	45	39	21
298	552	1,012	1,564	43	26	6
314	99	908	1,007	35	22	3
315	565	968	1,533	36	29	18
Totals	9,492	5,501	14,993	39	31	10

SOURCE: Zaborske, 1991b.

Table 4-18d
Cumulative Effects of Timber Harvest by 2011 for Alternative 4, in Acres

VCU	Cumulative Harvest in 1995	Projected Harvest 1995-2011	Cumulative Harvest in 2011	Percent Harvested Tentatively Suitable	Percent Harvested CFL	Percent Harvested Land Area
293	2,108	1,052	3,160	52	46	23
294	1,565	1,318	2,883	41	32	12
295	0	0	0	0	0	0
296	1,440	854	2,294	32	28	14
297	1,345	1,263	2,608	36	31	17
298	793	826	1,619	44	27	6
314	124	738	862	30	19	2
315	871	779	1,650	39	31	20
Totals	8,246	6,830	15,076	39	31	10

SOURCE: Zaborske, 1991b.

Table 4-18e
Cumulative Effects of Timber Harvest by 2011 for Alternative 5, in Acres

VCU	Cumulative Harvest in 1995	Projected Harvest 1995-2011	Cumulative Harvest in 2011	Percent Harvested Tentatively Suitable	Percent Harvested CFL	Percent Harvested Land Area
293	2,989	0	2,989	49	44	22
294	2,714	0	2,714	38	30	11
295	0	0	0	0	0	0
296	1,911	314	2,225	31	27	14
297	2,223	464	2,687	37	32	17
298	1,532	301	1,833	50	31	7
314	630	270	900	31	20	3
315	1,375	288	1,663	39	31	20
Totals	13,374	1,637	15,011	39	31	10

SOURCE: Zaborske, 1991b.

Alternative 2 projects the highest number of acres harvested by 2011 (15,381 acres), followed by Alternative 4 (15,076 acres), Alternative 1 (15,027 acres), Alternative 5 (15,011 acres), and Alternative 3 (14,993 acres). Although Alternative 2 projects 388 more acres harvested in 2011 than Alternative 3; 370 more acres than Alternative 5; 354 more acres than Alternative 1; and 305 more acres than Alternative 4, the difference in percent of tentatively suitable land harvested in 2011 between all alternatives is less than 1 percent. Thus, the cumulative effects of each alternative on the timber resource can be considered nearly the same. All alternatives would complete the first entry for the Project Area and begin the second entry (see Glossary for definition of harvest entry).

Long-term Productivity

The effects of all action alternatives on long-term timber productivity would be the conversion of unmanaged, overmature stands to managed, faster growing, second-growth stands. Overmature stands have lower forest floor temperatures than even-aged stands, reducing biological activity. Organic decomposition slows and thus the supply of available nutrients is reduced. With decreased biological activity, less nitrogen is available for tree growth and the tree's nutritional status is lowered. While overmature stands' growth and vigor remain nearly constant, they are at a level below that of even-aged stands (Harris and Farr, 1974). Table 4-19 displays average structural characteristics of managed stands by site classification (low, medium, and high).

The magnitude of the effect of converting unmanaged, overmature stands to managed, second-growth stands will vary depending upon the number of acres harvested in each site class (Table 4-2 found in the *Direct Effects - Timber and Other Vegetation* section). Alternative 5 converts the most acres to a managed condition (8,419 acres), followed by Alternative 2 (5,094 acres), Alternative 3 (4,537 acres), and Alternative 4 (3,291 acres). Alternative 1 proposes no harvest and thus converts no additional acres to a managed condition.

All timber proposed for harvest are mature or overmature and are well beyond the age of maximum average annual growth of the stand. They are representative of uneven-aged western hemlock stands that commonly take hundreds of years to develop under natural conditions if not manipulated by intensive forest management practices or changed by natural events such as windthrow.

The open conditions created in clearcuts allow both Sitka spruce and western hemlock to regenerate rapidly. Even-aged stands are generally comprised of 10 to 75 percent spruce depending on the soil type and the age of the stand. On average, the volume of spruce in even-aged stands 75 to 100 years after harvest is about 50 percent (Taylor, 1934) compared to 28 percent in existing mature and overmature stands. With the use of silvicultural practices such as precommercial thinning, an additional 10 percent or more increase in the spruce component is expected.

Although log quality in second-growth stands is expected to be lower than in mature and over-mature stands, even on sites that have been precommercially thinned, total yield per acre is expected to be higher in second-growth stands. The lower quality will be reflected in the log grades (sizes), with second-growth timber stands having fewer higher grade logs than existing mature and over-mature stands. In addition, second-growth stands will have less volume in the larger diameter classes. Nevertheless, total yield will be significantly greater in second-growth stands than in mature and overmature stands. The long-term result of precommercial thinning is the production of more usable fiber. Precommercial thinning also allows the option of reducing the rotation age because merchantable size logs are produced sooner on thinned sites than in areas not thinned.

Table 4-19
Average Structural Characteristics of Managed Stands by Site Classification

Stand Age (years)	Height (feet)	DBH (inches)	Volume/Acre (board feet)
Low Site			
5-20	19	1.3	0
20-50	48	5.1	1,800
50-80	74	7.9	8,500
80-100	88	9.6	18,400
100-120	102	11.2	30,100
120-160	122	14.2	49,200
Medium Site			
5-20	18	2.1	0
20-50	59	8.2	3,900
50-80	93	11.7	20,600
80-100	109	13.5	36,900
100-120	121	14.9	50,100
120-160	137	17.5	67,000
High Site			
5-20	21	2.7	0
20-50	72	9.5	7,500
50-80	107	13.2	36,700
80-100	123	15.1	53,800
100-120	134	16.8	64,900
120-160	151	19.7	83,700

SOURCE: Zaborske, 1991b.

Most second-growth stands will exhibit less variation in tree diameter and height than the mature and overmature stands they replace. At 100 years of age, average diameters for unmanaged second-growth stands will range from 10 inches on site index 85 to 14 inches on high sites. With several precommercial thinnings, it is possible to produce average stand diameters that approximate old-growth averages. In 100 to 110 years, diameters can range from 14 inches on site index 85 to more than 15 inches on high sites (Forest Service, 1990b).

Floodplains

The numerous streams in the Kelp Bay Project Area makes it impossible to avoid all floodplains during timber harvest related activities. Environmental consequences to floodplains from the alternatives are generally limited to effects from road construction. The small area of floodplains proposed for actual timber harvest would not affect flooding or erosion.

Direct and Indirect Effects

During road construction, both direct and indirect impacts to floodplains can occur. There may be no detectable influence, or there can be flow alteration in minor streams due to routing by roadside ditches and culverts. Channel and flow alteration can locally affect the velocity of flows, width and depth of water, and the location of flow. Such factors can physically result in different erosion and sediment transport characteristics.

BMPs (Forest Service [D]) are used to minimize impacts on floodplains as well as to protect roads and drainage structures. Examples of such practices include designing bridges and culverts to handle the expected flows, and installing frequent cross drains or ditch relief culverts to minimize erosion from large concentrations of water moving overland or where they enter natural drainages.

Logging activities are controlled to minimize damage to stream banks and bottoms from yarding, the process of conveying logs to a landing. Large wood in streams that contributes to stream stability and moderation of flow energy and velocity is generally left in place. In cases where large woody debris (LWD) upstream of bridges or culverts could move and block flow, it might be removed to ensure the passage of high flows without causing diversions and erosion.

None of the proposed alternatives would result in human occupancy of floodplains. Because the proposed action would have no floodplain development other than stream crossings, there would be no loss to property values from the proposed actions, nor would human health, safety, or welfare be adversely affected. Table 4-20 shows the acres of floodplains that would be affected by timber harvest and road construction as the result of each of the five alternatives.

Due to the limited changes expected in floodplains, the naturally high amounts of precipitation, and runoff conditions, the risk characteristics related to flooding would not change to a significant degree as a result of activities performed under each of the alternatives. In general, road location, construction measures, and drainage structures will have minimal impact on the natural and beneficial uses of floodplains in the Kelp Bay Project Area.

Table 4-20
Acres of Timber Harvest and Road Construction Within Floodplains by Alternative

	Alternative 1	2	3	4	5
Acres	0	27.7	30.4	26.2	99.1
% of Total Floodplains	0	1.4	1.5	1.3	4.9

SOURCE: West, 1991.

Wetlands

The amount of wetlands found in the Kelp Bay Project Area makes it impossible to avoid all wetland areas when implementing timber harvest activities. Of the 153,865 acres in the Project Area, 18,534 (approximately 12 percent) is classified as wetland. Many of the wetlands in the Project Area do not support commercial or economic stands of timber and are not scheduled for harvest in this or future entries. It is anticipated that there will be no net loss of wetlands with any of the alternatives. Soil moisture regimes and vegetation on some wetlands may be altered in some cases; however, these altered acres will still be classified as wetlands and function as wetlands in the ecosystem.

Direct and Indirect Effects

Wetlands that are timbered and scheduled for harvest may experience temporary changes in site-specific hydrology. Impacts may range from none to altering the soil moisture regime, puddling, compaction, soil displacement, and erosion. Wetlands can be logged in a way that maintains their wetland attributes. Wetlands that occur as small inclusions within forested areas may be affected by yarding operations within units. Water yield may increase and a temporary increase in soil moisture may result until equivalent transpiration and interception surfaces are re-established. Reforestation of wetland sites is expected to be slower than non-wetland sites.

The only construction in wetlands as a result of the alternatives will be of roads, landings, and associated drainage structures. The techniques and measures required by the Forest Service during road construction tend to preserve the natural values and functions of the affected wetlands. These techniques and measures include the use of permeable subgrade materials to avoid restricting the natural movement of water and frequent culverts to allow water to pass freely. These construction requirements usually limit impacts from roads to the wetland directly underlying the road prism (see Glossary) and associated cuts and fills. Less than 2 percent of the total acres of wetland in the Project Area would be directly affected by road construction under any of the alternatives (West, 1991).

Wetlands can be harvested in a way that protects their wetland attributes.

Construction and maintenance of the roads and landings will meet the BMP (Forest Service [D]). Use of BMPs will ensure that water flows, circulation patterns, and chemical and biological characteristics of the water within wetlands will not be impaired. Additionally, use of BMPs will ensure that adverse effects on the aquatic environment will be minimized. In terms of the terrestrial environment, wildlife inhabiting wetlands may be reduced during periods of vehicle traffic on the roads. The overall effect on 2 percent of the total wetland acres in the Project Area would be negligible.

Table 4-21 displays the acres that proposed activities will affect either directly or indirectly on wetland areas.

Table 4-21
Acres of Proposed Activities on Wetlands by Alternative

	Alternatives									
	1		2		3		4		5	
VCU	Unit	Rds	Unit	Rds	Unit	Rds	Unit	Rds	Unit	Rds
293	0	0	433	71	537	86	413	72	517	90
294	0	0	199	35	293	45	244	35	266	47
295	0	0	0	0	0	0	0	0	0	0
296	0	0	177	35	29	14	62	13	146	26
297	0	0	251	98	247	56	341	61	464	96
298	0	0	129	17	19	1	92	17	168	23
314	0	0	26	0	0	0	1	0	123	11
315	0	0	219	26	1	0	166	0	254	39
Sub-Total	0	0	1,434	282	1,126	202	1,319	198	1,938	332
Total		0		1,716		1,328		1,517		2,270
Percentage of Wetland Acres		0		9		7		8		12
% of Project Area		0		1.1		0.9		1.0		1.5

SOURCE: West, 1991.

All alternatives would have potential impacts on 12 percent or less of the total wetland acres in the Kelp Bay Project Area. Alternative 5 would potentially impact the most wetland acres with the location of both units and roads. Alternative 2 would impact the second largest area of wetlands, followed by Alternative 4 and 3. Alternative 1 would have no direct or indirect effects on wetlands.

Cumulative Effects

Cumulative effects on wetlands will vary little between alternatives because of the assumptions about levels of timber harvest scheduled through 2011 (Table 4-22). Potential cumulative impacts to wetlands are projected to affect less than 22 percent of the total wetland acres in the Kelp Bay Project Area.

Table 4-22
Projected Acres of Proposed Activities on Wetlands Through Year 2011 by Alternative

	Alternative 1	2	3	4	5
Unit Acres	3,133	3,276	3,013	3,569	2,773
Road Acres	457	488	493	445	439
Totals	3,590	3,764	3,506	4,014	3,212
Percentage of Wetlands	19.4	20.3	18.9	21.7	17.3

Wildlife

Information from Chapter 3, *Affected Environment*, provides the basis for evaluating impacts on the various wildlife habitats, wildlife Management Indicator Species (MIS), and biological diversity. The analysis considers the direct, indirect, and cumulative effects from timber management in the Project Area. Effects are projected to 1995, the anticipated end of the current proposed actions; 2011, halfway through the timber rotation and end of the long-term timber sale contract; and 2060, the end of the first timber rotation.

Direct Effects on Wildlife Habitat

Each alternative, except the No-action Alternative, unavoidably includes harvest of wildlife habitat. Project unit design criteria, BMPs (Forest Service [D]), and/or legislated protective measures (Tongass Timber Reform Act) significantly reduces impacts to beach fringe, estuary fringe, and riparian habitats in each alternative. Alpine/subalpine habitat is also affected very little by road and unit location because of inaccessibility and/or low productivity. Project Area-wide changes in these habitats are 9 percent or less for each alternative (Table 4-23). Impacts to MIS dependent on these habitats are similarly low. Alternative 1, the No-action Alternative, will have no direct effect on wildlife habitats.

Table 4-23
Acres and Percent of Wildlife Habitats Proposed for Harvest by Alternative

	Alternatives									
	1		2		3		4		5	
Habitat[1]	Acres Cut	% Change	Acres Cut	% Change	Acres Cut	% Change	Acres Cut	% Change	Acres Cut	% Change
Beach Fringe	0	0	6	<1	0	0	<1	<1	88	1
Estuary Fringe	0	0	48	<1	36	<1	8	<1	94	2
Riparian	0	0	587	6	283	3	357	4	798	9
Forest	0	0	5,094	5	4,537	5	3,291	3	8,419	8
Old Growth	0	0	5,094	10	4,537	9	3,291	6	8,419	17
Alpine/Subalp.	0	0	32	<1	29	<1	16	<1	52	<1

SOURCE: Weber, 1991.

[1] Habitats overlap so the *Acres Cut* column can not be added to reflect actual acres planned for harvest by alternative. For example, acres of old-growth timber that occur in the beach fringe or riparian habitats are also counted in the old-growth habitat total, and old-growth stands are part of the general forest habitat total.

Beach fringe habitat along the east side of Catherine Island. Percent of harvest in the beach fringe is 1 percent or less for all alternatives.

Beach Fringe

The percent of harvest in the beach fringe habitat is 1 percent or less for each alternative in the Project Area. Alternative 2 would harvest 6 acres and Alternative 5 would harvest 88 acres. Alternative 3 would harvest no beach fringe habitat and Alternative 4 would harvest less than 1 acre (Table 4-23). The effects of harvesting these amounts of beach fringe would be negligible

Estuary Fringe

Harvest is 2 percent or less of the total estuary fringe habitat in the Project Area for all alternatives (Table 4-23). Alternative 5 would harvest 94 acres (2 percent) throughout the Project Area while Alternatives 2, 3, and 4 would harvest less than 1 percent. The effects to wildlife from harvesting these amounts of estuary fringe in the Project Area would be negligible.

Riparian

Each alternative would harvest less than 10 percent of the total riparian habitat in the Project Area. Alternative 5 would harvest 798 acres (9 percent) while Alternatives 2, 3, and 4 would harvest 6 percent, 3 percent and 4 percent, respectively. The overall impacts to wildlife from harvesting these amounts of riparian forest in the Project Area would be minor.

Table 4-24
Changes to Old-Growth Habitat by Alternative

VCU	Total Acres 1990	Alt. 1 Acres Cut	Alt. 1 % Change	Alt. 2 Acres Cut	Alt. 2 % Change	Alt. 3 Acres Cut	Alt. 3 % Change	Alt. 4 Acres Cut	Alt. 4 % Change	Alt. 5 Acres Cut	Alt. 5 % Change
293	5,643	0	0	718	13	1,294	23	699	12	1,580	28
294	8,723	0	0	946	11	1,852	21	880	10	2,029	23
295	4,384	0	0	0	0	0	0	0	0	0	0
296	7,598	0	0	1,180	16	395	5	487	6	958	13
297	8,336	0	0	849	10	925	11	582	7	1,460	18
298	5,902	0	0	805	14	71	1	312	5	1,051	18
314	4,659	0	0	73	2	0	0	25	<1	531	11
315	4,947	0	0	523	11	0	0	306	6	810	16
Total	50,192	0	0	5,094	10	4,537	9	3,291	7	8,419	17

SOURCE: Weber, 1991

Forest

Forest habitat includes all areas with forest cover. All acres proposed for timber harvest under the alternatives are necessarily forest habitat as well as old-growth habitat. Each alternative would harvest 8 percent or less of the total forest habitat in the Project Area (Table 4-23). Table 4-25 shows the changes in forest habitat within VCUs by alternative and the relationship to acres present in 1990. Alternative 5 would harvest 8,419 acres (8 percent) of the total forest habitat while Alternatives 2, 3, and 4 would harvest 5,094, 4,537, and 3,291 acres, respectively. The overall impacts to wildlife from harvesting these amounts of forest habitat would be negligible.

Old-growth Forest

Most of the productive forested area in the Project Area is old-growth timber. Any acre scheduled for timber harvest by the alternatives is assumed to be old-growth habitat. Table 4-24 shows changes in old-growth habitat within VCUs by alternative and the relationship to acres present in 1990. During scoping, the public expressed concerns for the habitat for old-growth dependent species. Alternative 5 would harvest 17 percent of remaining old-growth while Alternatives 2, 3, and 4 would harvest 10 percent, 9 percent, and 7 percent, respectively. The effects of old-growth habitat loss on old-growth dependent species are reflected in the *Effects on Habitat Capability by MIS* section. Overall impacts to wildlife from harvesting these areas of old-growth forest in the Project Area would be minor.

Alpine/Subalpine

Proposed timber harvest is less than 1 percent for each alternative. Alternative 5 would harvest 52 acres and Alternatives 2, 3, and 4 would harvest 32, 29, and 16 acres, respectively (Table 4-23). These levels of harvest would result in negligible effects on wildlife that use the alpine/subalpine habitat in the Project Area.

Table 4-25
Changes to Forest Habitat by Alternative

		Alternatives									
	Total	1		2		3		4		5	
VCU	Acres 1990	Acres Cut	% Change	Acres Cut	% Change	Acres Cut	% Change	Acres Cut	% Change	Acres Cut	% Change
293	11,643	0	0	718	6	1,294	11	699	6	1,580	14
294	16,357	0	0	946	6	1,852	11	880	5	2,029	12
295	9,024	0	0	0	0	0	0	0	0	0	0
296	13,702	0	0	1,180	9	395	3	487	4	958	7
297	15,164	0	0	849	6	925	6	582	4	1,460	10
298	13,690	0	0	805	6	71	<1	312	2	1,051	8
314	10,018	0	0	73	1	0	0	25	<1	531	5
315	7,756	0	0	523	7	0	0	306	4	810	10
Total	97,354	0	0	5,094	5	4,537	5	3,291	3	8,419	8

SOURCE: Weber, 1991.

Comparison of Alternatives

The pronounced direct effect on wildlife habitats in each action alternative is the loss of old-growth stands and forest habitat. Impacts to other habitats were greatly reduced through unit and road design prior to alternative development. Alternative 1, the No-action Alternative, would have no direct effect on wildlife habitats while Alternative 5 would have the same direct impact as or greater direct impact than the other alternatives on each habitat. Alternative 2 would have the second greatest direct effect followed by Alternative 3 and then Alternative 4. Each alternative would result in direct effects consistent with the amount of timber allowed to be harvested under implementation of the TLMP (Forest Service, 1979a) and would have negligible or minor impacts overall on wildlife habitats and dependent wildlife.

Direct and Indirect Effects on Habitat Capability

The previous section discusses changes to wildlife habitats used by the MIS. This section discusses how the changes in habitats affect the potential habitat capability for each MIS. As mentioned in the *Affected Environment* section, the models that estimate the capability of habitats to support populations of selected species are not accurate reflections of actual populations in the Project Area. Actual population levels for the MIS are not known at this time.

Existing habitat capabilities for all MIS will be maintained in VCU 295, Lake Eva, under each action alternative. VCUs 316 and 317 south of the Project Area and part of Wildlife Analysis Area 3731 would also retain current habitat capabilities although they were not included in this analysis. Each alternative would maintain habitat capable of supporting populations above minimum viable levels identified by the U. S. Forest Service (Forest Service, 1990c). Human development and access could reduce habitat capability for marten, brown bear, and mountain goat through increased pressure from hunting and trapping. Human development or access was not considered a major factor in the Project Area because no human-populated community exists in the Project Area or is connected to the Project Area by road or ferry. Existing roads in the Project Area do not show recent evidence of vehicle use.

Several MIS show a habitat/use relationship with the size of preferred habitats. The wildlife models for this analysis do not take into account those patch size relationships but still provide an effective comparison between alternatives. The potential effects of patch size and human developments are included in Appendix G. Direct impacts to brown bear, otter, bald eagle, and mountain goat have been greatly reduced in all action alternatives through avoidance of timber harvest in beach fringe, estuary fringe, stream corridors, riparian, and alpine/subalpine habitats.

Alternative 1, the No-action Alternative, would have no direct effect on habitat capabilities for any MIS.

Sitka black-tailed deer are among the MIS most affected by proposed timber harvest under the action alternatives.

Sitka Black-tailed Deer

Sitka black-tailed deer are dependent on low-elevation, high-volume, old-growth timber stands during severe winters and are among the MIS most affected by proposed timber harvest under the action alternatives. Alternative 5 would decrease habitat capability 18 percent in the Project Area while Alternatives 2, 3, and 4 would decrease habitat capability 12 percent, 10 percent, and 9 percent, respectively (See Figure 4-2 for numbers).

Indirect effects of second-growth canopy closure in timber stands 20 to 30 years after harvest may at least be partially mitigated by thinning to promote forage production (Hanley et al., 1989; Kessler, 1982; Hanley, 1984). Second-growth forest management has been widely used in Southeast Alaska, but the benefits to Sitka black-tailed deer have not been well documented. Because the Project Area has moderate and high snow ratings, clearcuts and second-growth stands have little or no value for deer winter range and have little influence on habitat capability.

Mountain Goat

Habitat capability for mountain goat would not be greatly affected by any of the alternatives. Alternative 5 would decrease habitat capability only 1 percent by harvesting habitat capable of supporting approximately one animal. All other action alternatives propose to harvest no habitat or less habitat than could support one mountain goat. Human developments or access

have the potential to decrease habitat capabilities (Table G-4, Appendix G). In the Project Area, the influence of humans would be negligible because timber harvest generally avoids alpine/subalpine habitats.

Brown Bear

Avoidance of beach fringe, estuary fringe, stream corridors, and riparian habitat with timber harvest is reflected in a 4 percent or less decline in brown bear habitat capability for all action alternatives (Figure 4-3). Alternative 5 would harvest habitat capable of supporting nine brown bear representing a 4 percent decline in habitat capability. Alternatives 2, 3, and 4 would decrease habitat capability 2 percent, 2 percent, and 1 percent, respectively. Human disturbance from vehicle access and/or habitation could further reduce habitat capability (Appendix G, Table G-1). These factors would not greatly influence habitat capabilities in the Project Area if roads and logging camps are closed following timber harvest. Indirect effects from logging camps can be mitigated by appropriate refuse disposal and a joint ADF&G and Forest Service information-sharing program for logging camp residents (See Chapter 2).

The alternatives tend to avoid beach fringe, estuary fringe, stream corridors, and riparian habitat for timber harvest. Effects to brown bear habitat capability are expected to be minor.

Red Squirrel

Red squirrel is most successful in old-growth spruce stands. Changes in habitat capability under the action alternatives range from 10 percent to 3 percent. Alternative 5 would harvest habitat capable of supporting 7,920 red squirrel, but this would only represent a 10 percent change in capability in the Project Area. Alternatives 2, 3, and 4 would decrease habitat capability 6 percent, 5 percent, and 3 percent, respectively (Figure 4-4).

Otter

Otter is another species that benefitted from measures taken during unit design that limited timber harvest in beach fringe, estuary fringe, stream corridors and riparian habitat. All action alternatives decrease habitat capability by 3 percent or less in the Project Area. Alternative 5 would harvest habitat capable of supporting 3 otter for a 3 percent decline in habitat capability. Alternatives 2, 3, and 4 would decrease habitat capability less than 1 percent (Figure 4-5).

Marten

Marten are an old-growth dependent species that uses a wide range of old-growth volume classes, tree species, and landscape positions. All action alternatives would result in an 11 percent or less decline in habitat capability for marten in the Project Area (Figure 4-6). Alternative 5 would harvest habitat capable of supporting 28 marten for an 11 percent decline in habitat capability. Alternative 2 would decrease habitat capability 6 percent. Alternatives 3 and 4 would decrease habitat capability 5 percent. Marten are sensitive to overharvest as a result of road access for trapping (Figure G-1, Appendix G). Impacts would be minimal where roads are closed following timber harvest.

Brown Creeper

Brown creeper are dependent on high volume old-growth timber and as a result can be greatly affected by timber harvest. Habitat capabilities decline in the Project Area from 18 percent with Alternative 5 to 4 percent with Alternative 4. Alternatives 2 and 3 would decrease habitat capability 10 percent and 6 percent, respectively (Figure 4-7).

Red-breasted Sapsucker

The red-breasted sapsucker is able to use lower volume, old-growth stands effectively, so this species is not as affected by proposed timber harvest as brown creeper or hairy woodpecker. All alternatives would decrease habitat capability 14 percent or less. Alternative 5 would harvest habitat capable of supporting 1,444 red-breasted sapsuckers for a 14 percent decline in capability. Alternatives 2, 3, and 4 would decrease habitat capability 9 percent, 8 percent, and 6 percent, respectively (Figure 4-8). Snag retention in clearcuts may mitigate some of the impacts from timber harvest (See Chapter 2).

Hairy Woodpecker

The hairy woodpecker is between brown creeper and red-breasted sapsucker in dependence on high volume old growth. Like red-breasted sapsucker, hairy woodpecker is a primary excavator and is able to effectively use lower volume stands. Alternative 5 would decrease habitat capability 17 percent in the Project Area; Alternatives 2 and 3 would decrease capability 9 percent, and Alternative 4 would decrease capability 6 percent, respectively (Figure 4-9). Hairy woodpeckers may also benefit from snag retention in clearcuts as a mitigation for timber harvest (See Chapter 2).

Vancouver Canada Goose

The Vancouver Canada goose nests in forested areas in proximity to wetlands and preferred food plants. All alternatives would decrease habitat capability 5 percent or less in the Project Area (Figure 4-10). Alternative 5 would decrease habitat capability 5 percent in the Project Area; Alternative 2, 3 percent, Alternative 4, 2 percent, and Alternative 3, less than 1 percent.

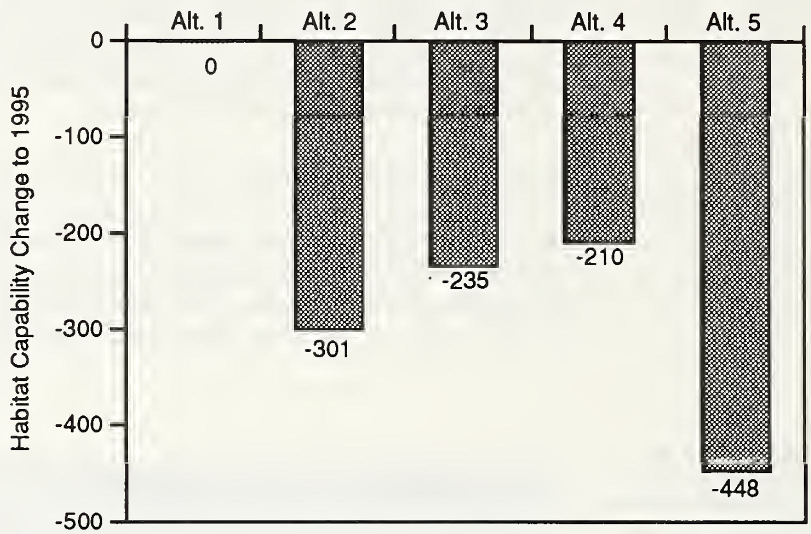
Vancouver Canada geese use forested habitat for nesting and brood rearing. Effects to goose habitat capability would be minor or less than 5 percent for all alternatives.

Bald Eagle

Scheduling of development activities away from beach fringe, estuaries, and Class I and II streams would effectively reduced impacts to bald eagle habitat. Habitat capability decreases from 3 percent under Alternative 5 to less than 1 percent under the other alternatives on a Project Area wide basis (Figure 4-11).

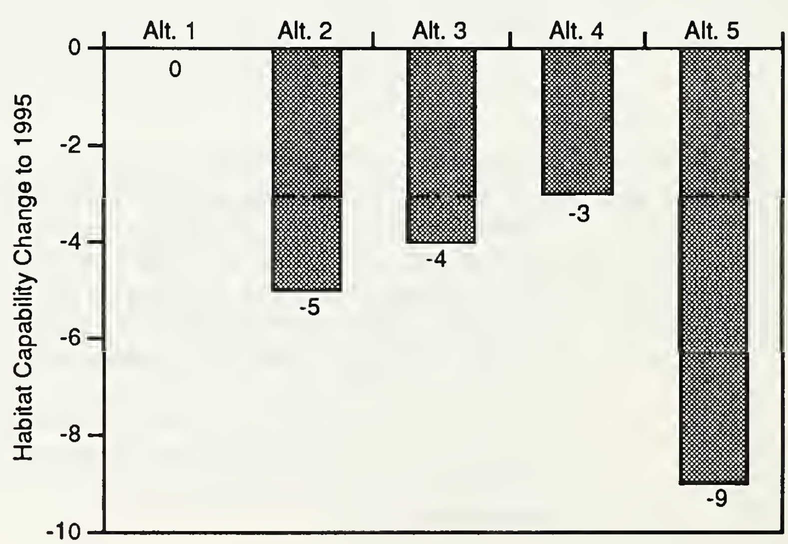
Management activities within 330 feet of an eagle nest site are restricted by a Memorandum of Understanding (MOU) between the Forest Service and the U. S. Fish and Wildlife Service. Proposed activities within this 330-foot buffer could affect nesting use or success by bald eagles. Possible variances from the MOU with the U.S. Fish and Wildlife Service regarding 330-foot buffers around eagle nest sites are displayed in Table 4-26. The number of bald eagle nest sites that may be disturbed by management activities is considered a direct effect. The potential number of variances required could be as many as 24 under Alternative 5 or as few as 13 under Alternative 3. Not all road and unit locations in relationship to surveyed eagle nest sites are known at this time but will be determined for the Final EIS. Factors that will influence the impacts from variances are timing and duration of disturbance within the buffer zone, presence of an eagle nest, active or inactive status of a nest, and proximity to an existing road or LTF.

Figure 4-2
Changes in Habitat Capability for Deer by Alternative to 1995



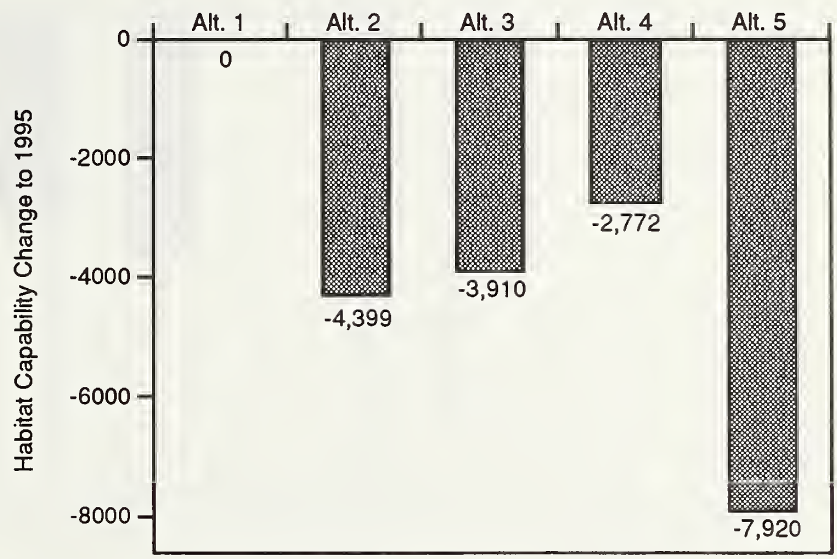
SOURCE: Weber, 1991.
Note: Total Deer habitat capability in 1990 = 2,446.

Figure 4-3
Changes in Habitat Capability for Brown Bear by Alternative to 1995



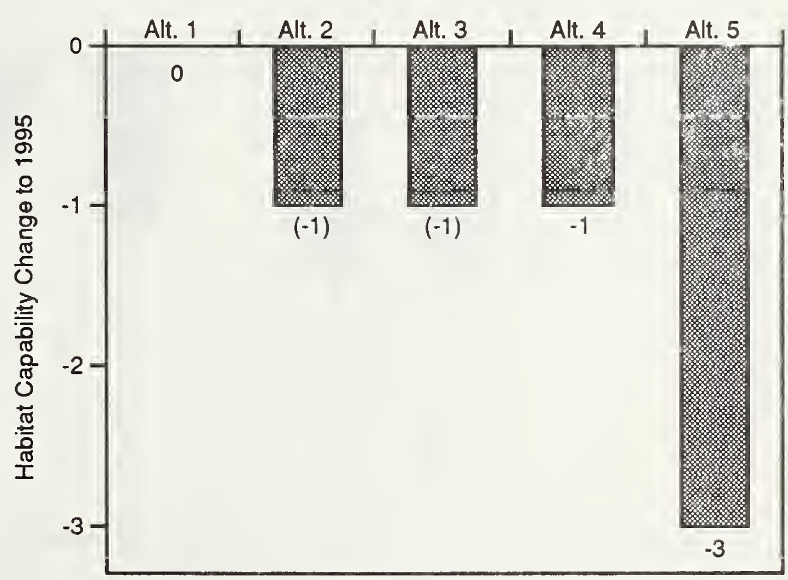
SOURCE: Weber, 1991.
Total Brown Bear habitat capability in 1990 = 209.

Figure 4-4
Changes in Habitat Capability for Red Squirrel by Alternative to 1995



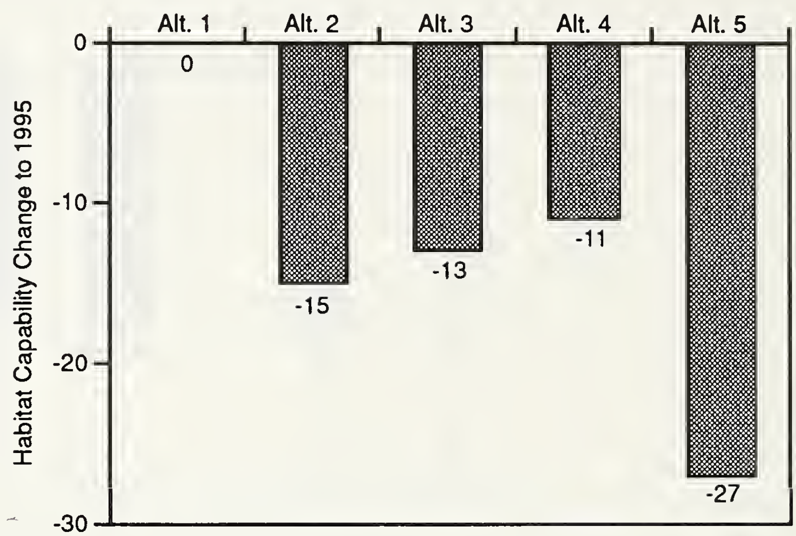
SOURCE: Weber, 1991.
Note: Total Red Squirrel habitat capability in 1990 = 79,255.

Figure 4-5
Changes in Habitat Capability for Otter by Alternative to 1995



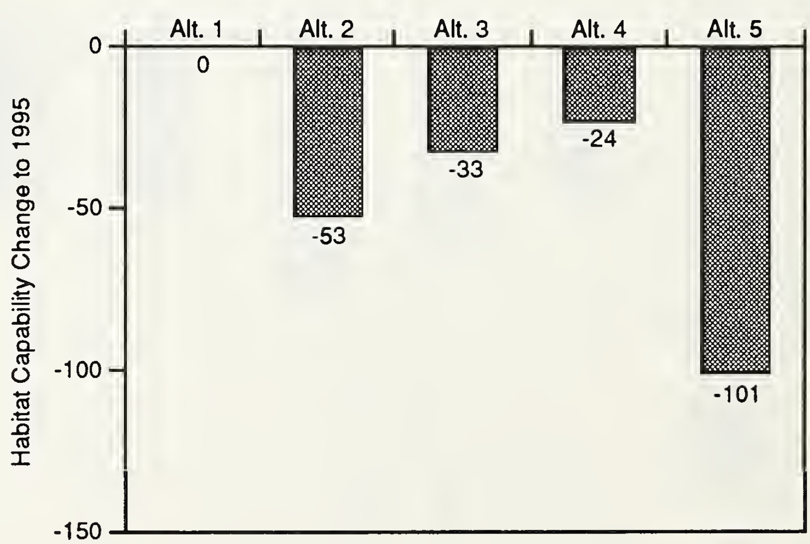
SOURCE: Weber, 1991.
Note: Parenthesis () indicate a value less than that displayed.
Total Otter habitat capability in 1990 = 103.

Figure 4-6
Changes in Habitat Capability for Marten by Alternative to 1995



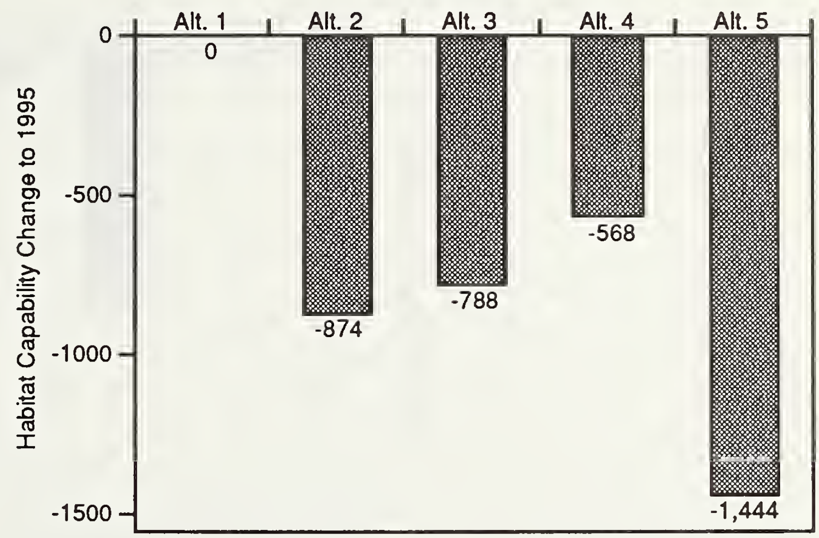
SOURCE: Weber, 1991.
Note: Total Marten habitat capability in 1990 = 244

Figure 4-7
Changes in Habitat Capability for Brown Creeper by Alternative to 1995



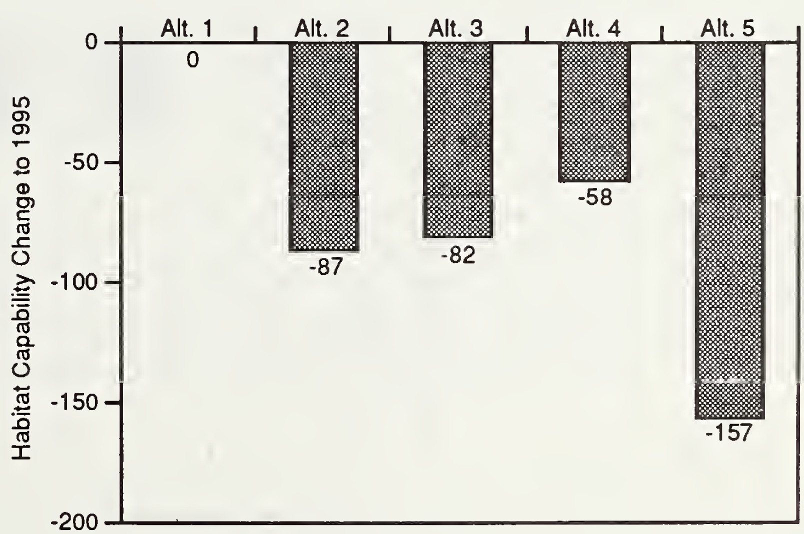
SOURCE: Weber, 1991.
Note: Total Brown Creeper Habitat in 1990 = 546.

Figure 4-8
Changes in Habitat Capability for Red-Breasted Sapsucker by Alternative to 1995



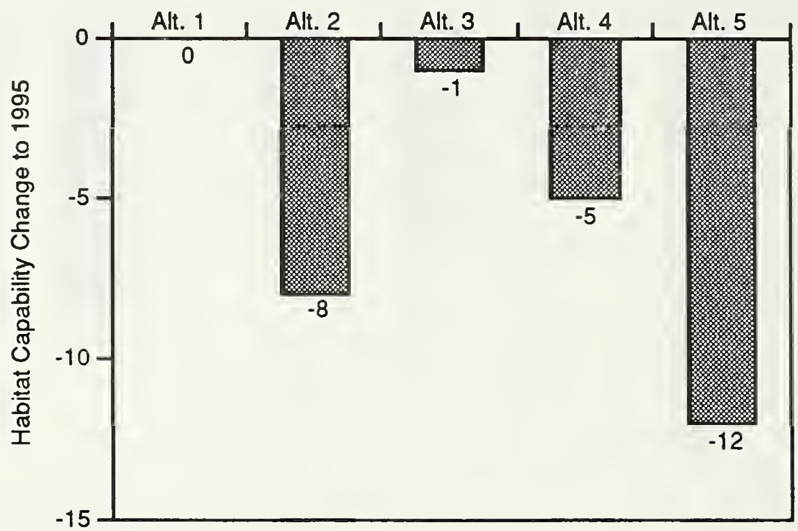
SOURCE: Weber, 1991.
Note: Total Red-Breasted Sapsucker habitat capability in 1990 = 10,137.

Figure 4-9
Changes in Habitat Capability for Hairy Woodpecker by Alternative to 1995



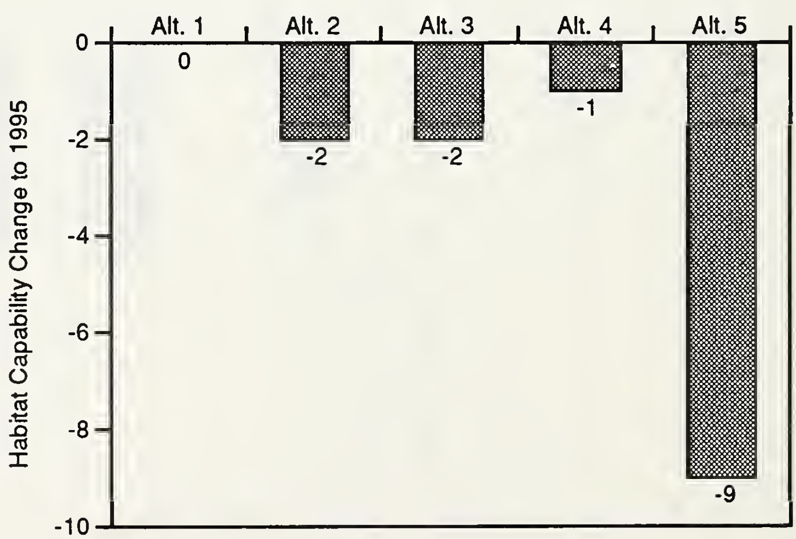
SOURCE: Weber, 1991.
Note: Total Hairy Woodpecker habitat capability in 1990 = 941

Figure 4-10
Changes in Habitat Capability for Vancouver Canada Goose by Alternative to 1995



SOURCE: Weber, 1991.
Note: Total Vancouver Canada Goose habitat capability in 1990 = 231.

Figure 4-11
Changes in Habitat Capability for Bald Eagle by Alternative to 1995



SOURCE: Weber, 1991.
Note: Total Bald Eagle habitat capability in 1990 = 324.

Table 4-26
Potential Eagle Tree Variances Needed by Alternative[1]

	Alternatives				
VCU	1	2	3	4	5
293	0	1	1	1	1
294	0	1	1	1	1
295	0	0	0	0	0
296	0	6	6	6	6
297	0	7	5	7	7
298	0	0	0	0	0
314	0	0	0	0	6
315	0	3	0	1	3
Total	0	18	13	16	24

SOURCE: Weber, 1991.

[1] Exact nest locations in relation to proposed roads and units are not known for all nest locations at this time, but survey data indicates that this number of variances could be required for management activities proposed within 330 feet of nest locations. Additional field work will be completed between the Draft EIS and Final EIS.

Comparison of Alternatives

All of the action alternatives would decrease habitat capabilities less than 20 percent and in most cases less than 10 percent (Table 4-27). Alternative 1, the No-action Alternative, maintains the current habitat capabilities for the MIS. The greatest decreases would result under Alternative 5 which proposes to harvest the most old-growth timber. Alternatives 2, 3, and 4 propose to harvest decreasing amounts of old-growth timber and exhibit respectively higher habitat capabilities. Alternative 3 would focus timber harvest only in the Peril Strait VCUs, except VCU 295. Habitat capabilities would be lower in those VCUs compared to Alternatives 2 or 4, which propose to harvest in all VCUs, except VCU 295. Under Alternative 3, habitat capabilities would be maintained in VCUs 314 and 315 and most of VCU 298.

Alternative 1 would provide the most protection to bald eagle nest sites in the Project Area while Alternative 5 has the potential to impact the most sites (24). Alternatives 3, 4, and 2 would likely impact 13, 16, and 18 nest sites, respectively. The direct effects on habitat capabilities for all MIS are largely unavoidable given the impacts to wildlife habitats from the level of timber harvest allowed under implementation of TLMP. Direct effects on habitat capabilities overall would be negligible or minor for each alternative.

Table 4-27
Changes in Habitat Capability by Alternative to 1995

		Alt. 1		Alt. 2		Alt. 3		Alt. 4		Alt. 5	
Species	Habitat Cap. in 1990	Change to 1995	Percent Change	Change to 1995	Percent Change	Change to 1995	Percent Change	Change to 1995	Percent Change	Change to 1995	Percent Change
Sitka Black-tailed Deer	2,446	0	0	-301	12	-235	10	-210	9	-448	18
Mountain Goat	89	0	0	(-1)	(1)	0	0	-1	(1)	-1	1
Brown Bear	209	0	0	-5	2	-4	2	-3	1	-9	4
Red Squirrel	79,255	0	0	-4,399	6	-3,910	5	-2,772	3	-7,920	10
Otter	103	0	0	(-1)	(1)	(-1)	(1)	-1	(1)	-3	3
Marten	244	0	0	-15	6	-13	5	-11	5	-27	11
Brown Creeper	546	0	0	-53	10	-33	6	-24	4	-101	18
Red-breasted Sapsucker	10,137	0	0	-874	9	-788	8	-568	6	-1,444	14
Hairy Woodpecker	941	0	0	-87	9	-82	9	-58	6	-157	17
Vancouver Canada Goose	231	0	0	-8	3	-1	(1)	-5	2	-12	5
Bald Eagle	324	0	0	-2	(1)	-2	(1)	-1	(1)	-9	3

SOURCE: Weber, 1991.

Note: Parentheses ( ) indicate a value less than that displayed.

Direct Effects on Biological Diversity

The Project Area would remain a diverse and largely natural environment under all alternatives. MIS would be above minimum viable population levels identified by the Tongass National Forest (Forest Service, 1990c) and remain well distributed throughout the Project Area. Wildlife habitats will remain well connected by beach and estuary fringe, stream corridors and the myriad of muskegs, oversteepened slopes, and other unscheduled areas. Managed stands would change from multi-aged old-growth timber to even-aged stands of timber in early succession/understory colonization stage. The shift from high within-stand diversity to high between-stand diversity may resemble natural windthrow and landslide events but on a much larger scale than could be considered natural in Southeast Alaska. Landscapes in the Project Area are naturally fragmented by muskegs, windthrow, landslides, rock, and ice. Timber harvest further separates old-growth habitats.

Opportunities for extensive areas (1,000 to 5,000 acres) of undisturbed old-growth to maintain natural ecosystem processes and landscape scale wildlife species that require large areas of old-growth exist in all alternatives. Within the three WAAs that the Project Area is part of, VCUs 295, 316, and 317 are LUD II areas that would remain unharvested in all alternatives throughout the rotation. Centrally located in the Project Area, VCU 295 provides 11,554 acres of old growth including 4,399 acres in Volume Class 4 and higher timber. VCUs 316 and 317 lie on the southern end of the Project Area and together represent 9,709 acres of old-growth forest and 3,804 acres of Volume Class 4 and higher timber (Weber, 1991).

Effects on diversity would be addressed in terms of successional changes and opportunities for large areas of old growth. Responses of the MIS to each alternative can be another indicator of changes in diversity. Those changes are discussed in the *Direct and Indirect Effects of Habitat Capability for MIS* section.

Alternative 1

Alternative 1 would not change the successional makeup or overall diversity of the Project Area. Several 1,000- to 5,000-acre areas of contiguous undisturbed old-growth timber would remain for the maintenance of natural ecosystem processes and landscape scale wildlife species. Watersheds where timber harvest has occurred previously would be allowed to develop successionally.

Alternative 2

Under Alternative 2, 5,094 acres or approximately 3 percent of the Project Area would change from old-growth stands to early succession. The shift in successional makeup will increase between-stand diversity but not reflect the natural vegetative pattern in the Project Area and may further fragment old-growth habitat. The only undisturbed watersheds outside of LUD II areas would be Clear and Glacier rivers. Both watersheds have less than 1,000 acres of contiguous Volume Class 4 or higher old-growth timber (Weber, 1991).

Alternative 3

Alternative 3 would result in 4,537 acres of old-growth or approximately 3 percent of the Project Area changing to early succession. The shift in successional makeup would be in VCUs 293, 294, 296, and 297. Large areas of undisturbed old growth would be preserved in VCUs 296, 297, 298, 314, and 315. Previously harvested areas in the Basin of Kelp Bay and the Bourbon Creek watershed would have additional time to develop successionally before more timber is harvested.

Alternative 4

Under Alternative 4, 3,291 acres or 2 percent of the Project Area would shift from old growth to early succession. The change in successional makeup would be fairly well distributed between VCUs. Bourbon Creek and Appleton Creek watersheds which were harvested in the previous entry would not be heavily harvested during this entry. Cosmos Cove, Clear River, Glacier River, Twin Lakes and Little Little Lake Eva watersheds and the southern two-thirds of Catherine Island would provide areas of undisturbed old-growth in addition to the LUD II areas.

Alternative 5

Timber harvest in Alternative 5 would change 8,419 acres of old-growth stands to early succession. This is a 5 percent change in the vegetation pattern in the Project Area and would be spread between all VCUs except the LUD II areas. Areas of undisturbed old growth would not be extensive but would include Glacier River watershed, the Portage Arm peninsula, and the southern half of Catherine Island.

The southern half of Catherine Island would retain existing characteristics under Alternatives 3 through 5.

Comparison of Alternatives

Alternative 1 would do the most to preserve the natural biological diversity of the Project Area and maintain natural ecosystem processes. Alternative 4 would have the least overall impact on biological diversity among the action alternatives. Alternative 4 would harvest the least acreage, so habitat capabilities for MIS would decline the least, and several watersheds would remain undisturbed. Alternative 5 would result in the greatest change in natural

diversity with the greatest changes in successional makeup, habitat capabilities, and the least area of undisturbed old growth. Alternatives 2 and 3 would be between 4 and 5 in their effects on diversity. Alternative 3 would leave several watersheds undisturbed in Kelp Bay while concentrating impacts in the Peril Strait VCUs. Alternative 2 would leave only 2 watersheds undisturbed by timber harvest outside of LUD II areas and would distribute impacts across the Project Area, including previously harvested watersheds. The direct effects on biological diversity under all action alternatives are consistent with the amount of timber harvest allowed under implementation of TLMP.

Direct and Indirect Effects on Consumptive Use of Wildlife

The availability of wildlife to meet the demands of hunters and trappers could be affected by the proposed actions. Reductions in habitat capability could decrease availability over time, roads could increase availability through greater access, and the presence of resident camps could increase demand. The principal wildlife species used by hunters and trappers that are sensitive to management activities and overuse are brown bear, marten, otter, and Sitka black-tailed deer.

Habitat capabilities for brown bear, marten, and otter appear high enough to support current levels of harvest with all alternatives. The average harvest of marten was 30 per year between 1985 and 1989 (Table 3-16) from WAAs 3313, 3315, and 3731. There would be habitat capable of supporting at least 217 marten in the Kelp Bay Project Area with any of the alternatives. Additional habitat outside the Project Area but within the WAAs would provide further support for the level of harvest. Table 4-38 shows the 1988 marten harvest, the estimated marten population carrying capacity in the Kelp Bay Project Area based on the habitat capability model, and the percentage of the total estimated population that level of harvest represents.

An average of nine otter were harvested per year between 1980 and 1989 in the three Kelp Bay Project Area WAAs (Table 3-15). There would be habitat capable of supporting at least 100 otter with any of the alternatives in the Project Area alone. Habitat capabilities in VCUs 291, 292, 316, and 317 would provide additional animals to support the current level of harvest. The otter harvest is only 7 percent of the estimated carrying capacity in the Kelp Bay Project Area alone (Table 4-28).

An average of 7 brown bear were harvested per year between 1980 and 1989 in WAAs 3313, 3315, and 3731 (Table 3-14). There would be habitat capable of supporting at least 200 brown bear with any of the alternatives. Additional habitat capability exists in VCUs 291, 292, 316, and 317. How much is not currently known. Table 4-38 shows that the brown bear harvest is only 4 percent of the estimated carrying capacity in the Kelp Bay Project Area alone.

Habitat capabilities for Sitka black-tailed deer do not appear high enough to support the current demand with any of the alternatives. As discussed in Chapter 3, habitat capabilities even before 1961 probably were not sufficient to support current harvest at a level of 10 percent of the population. The harvest in 1989 was 511 deer from WAAs 3313, 3315, and 3731 (Table 3-12). The current level of harvest is 21 percent of the estimated population carrying capacity (Table 4-28). Potential habitat capability declines under proposed alternatives would decrease the estimated population carrying capacity and increase the harvest percentage to as much as 26 percent. Although additional habitat capability exists in VCUs 291, 292, 316, and 317, it probably would not be enough to support enough deer to bring the current level of harvest down to 10 percent of the estimated population carrying capacity in the three WAAs.

Table 4-28
Estimated Carrying Capacity Compared to Demand for Brown Bear, Marten, Otter and Sitka Black-tailed Deer[1]

Species	Animals Harvested 1989	Alt 1 1995	Alt 1 %[2]	Alt 2 1995	Alt 2 %	Alt 3 1995	Alt 3 %	Alt 4 1995	Alt 4 %	Alt 5 1995	Alt 5 %
		Estimated Carrying Capacity and Percent Harvest									
Marten	34[3]	244	14	229	15	231	15	233	15	217	16
Otter	7	103	7	103	7	103	7	102	7	100	7
Brown Bear	8	209	4	204	4	205	4	206	4	200	4
Deer	511	2,446	21	2,145	24	2,211	23	2,236	23	1,998	26

SOURCE: Weber, 1991.

[1] Demand is based on harvest levels from WAAs 3313, 3315, and 3731 that correspond to 12 VCUs while the habitat capability is based on only the 8 VCUs in the Kelp Bay Project Area.
[2] This is the percent of the total population, based on habitat capability, that the 1989 level of harvest represents.
[3] Demand for marten is based on the 1988 harvest level. None were harvested in 1989.

Roads constructed in the Kelp Bay Project Area will increase access for hunting and trapping. Most of the effects of increased access will take place while logging and road construction camps are operating in the Project Area. Because of the remoteness of the Project Area, camp residents are the only ones likely to have motorized vehicles available to take advantage of the road system. Camp residents would be in a unique position to take advantage of seasonal availability and chance encounters with wildlife. The increased access and human habitation could result in greatly elevated levels of harvest of wildlife.

Over-harvest of wildlife species could be avoided if hunting and trapping seasons are closed during logging and road construction. Camp and road closures following logging would mitigate most of the adverse effects of increased access while still providing opportunities for foottravel for sport or subsistence hunting and trapping.

Direct, Indirect, and Cumulative Effects on Threatened, Endangered and Sensitive Species

Proposed actions in each of the alternatives are not anticipated to adversely affect directly, indirectly, or cumulatively the humpbacked whale, Steller sea lion, American peregrine falcon, or marbled murrelet in the Kelp Bay Project Area. Biological assessments will be prepared and included in the Final EIS.

Cumulative Effects

Cumulative effects include past timber harvest, the proposed actions, and timber harvest in the reasonably foreseeable future. The TLMP projects timber harvest through a full 100-year rotation. This portion of the analysis (reasonably foreseeable) will focus on effects to the year 2011 which is halfway through a normal timber rotation. The following assumptions were made for projecting effects to 2011.

- Approximately the same amount of timber will need to be harvested from the Project Area to meet contractual obligations by 2011, irrespective of levels of timber harvest proposed in the current alternatives.

- Future impacts to beach fringe, estuary fringe, stream corridors, riparian and alpine/subalpine habitats will be similar to those anticipated in the current alternatives.

- Future timber harvest decreases the habitat capability for MIS proportional to the total acres of harvested old growth. For example, if harvesting 5,000 acres using current resource protection measures and economic considerations yields a decrease of 2 percent for mountain goat, another 5,000 acres cut before 2011 would probably yield a similar decrease.

Indirect and Cumulative Effects on Wildlife Habitats

The effect common to all alternatives is that the Project Area will be extensively harvested to fully implement the TLMP and meet timber sale contractual obligations. Large undisturbed areas of old growth are not likely to exist outside of areas administratively withdrawn from consideration for timber harvest. Table 4-29 shows the percentages of habitats affected by previous timber harvest. Past timber harvest predated TLMP standards and guides in 1980, and some habitats were disproportionately affected during earlier entries. Only another 1 to 2 percent of beach fringe, estuary fringe, inland wetland, riparian and alpine/subalpine habitats are anticipated to be harvested between 1995 and 2011.

Table 4-29

Cumulative Acres and Percent of Wildlife Habitats Proposed for Harvest by Alternative

		Alternatives									
	Acres Cut Pre-	1		2		3		4		5	
Habitat[1]	1990	Acres Cut	Cum. %	Acres Cut	Cum. %	Acres Cut	Cum. %	Acres Cut	Cum. %	Acres Cut	Cum. %
Beach Fringe	534	0	7	6	7	0	7	<1	7	88	8
Estuary Fringe	1,158	0	19	48	19	36	19	8	19	94	20
Riparian	413	0	4	587	11	283	7	357	8	798	13
Forest	4,955	0	5	5,094	10	4,537	10	3,291	8	8,419	14
Old Growth	4,955	0	9	5,094	18	4,537	17	3,291	15	8,419	24
Alpine/Subalp.	178	0	<1	32	<1	29	<1	16	<1	52	<1

Source: Weber, 1991.

[1] Habitats overlap so *Acres Cut* column can not be added to reflect actual acres planned for harvest by alternative. For example, acres of old-growth timber that occur in the beach fringe or riparian habitats are also counted in the old-growth habitat total and old-growth is part of the general forest habitat total.

Harvest by the end of the APC contract would retain 72 percent of the old-growth habitat. Young timber stands would mix with the old-growth forest in a mosaic pattern.

Between 39,766 and 40,154 acres of old-growth forest or at least 72 percent of the old growth that existed in 1960 would remain in the Project Area under all alternatives (Table 4-15). Old-growth acres remaining under all alternatives would exceed the scheduled amount of retention for the rotation by approximately 33,500 acres. TLMP incorporated retention factors that were used to calculate the percent reduction from maximum timber yield that would be expected from management constraints for protection of wildlife, fishery and visual resources. In the Project Area, there are approximately 6,200 acres of retention scheduled that exists in beach fringe, estuary fringe, stream corridors, riparian, and other unscheduled areas.

Table 4-30 shows the acres of total forest habitat remaining in 2011 and illustrates the effect of succession, aided by artificial regeneration in some cases, on maintaining forest habitat over time. Approximately 89 percent of the forest habitat in the Project Area would remain under all alternatives.

Cumulative impacts through 2011 vary little in total acres harvested between alternatives. Alternative 1 would maximize impacts between 1995 and 2011. The impact to wildlife of altering 10,072 acres during one entry (Table 4-18a) would be much greater than harvesting the same acreage in 2 entries. Alternative 5 would have the most impact through 1995 but have little additional effect between 1995 and 2011. Alternatives 2, 3, and 4 distribute the impact of habitat loss more evenly between the 1990-1995 and 1995-2011 entries. Alternative 3 concentrates cumulative habitat loss through 1995 in the Peril Strait VCUs while Alternatives 2, 4, and 5 distribute the impacts across the Project Area.

Table 4-30
Projected Acres of Forest Habitat Remaining by Alternative

Pre-1961 VCU	Acres	Alternatives 1 1995	1 2011	2 1995	2 2011	3 1995	3 2011	4 1995	4 2011	5 1995	5 2011
293	11,643	11,643	10,063	10,925	10,823	10,349	11,643	10,944	10,593	10,063	11,643
294	16,357	16,357	14,328	15,411	15,329	14,505	16,357	15,477	15,042	14,328	16,357
295	9,024	9,024	9,024	9,024	9,024	9,024	9,024	9,024	9,024	9,024	9,024
296	13,702	13,702	12,430	12,522	13,037	13,307	12,646	13,215	12,850	12,744	13,388
297	15,164	15,164	13,241	14,315	14,179	14,239	13,608	14,582	13,903	13,704	14,701
298	13,690	13,690	12,338	12,885	13,046	13,619	12,678	13,378	12,865	12,639	13,389
314	10,018	10,018	9,217	9,945	9,443	10,018	9,110	9,993	9,282	9,487	9,748
315	7,756	7,756	6,658	7,233	7,149	7,756	6,788	7,450	6,979	6,946	7,468
Total	97,354	97,354	87,299	92,260	92,030	92,817	91,854	94,063	90,538	88,935	95,718

SOURCE: Weber, 1991.

[1] Based on the assumption that between 1995 and 2011 the acres harvested under the current alternatives will be regenerated to a forest condition.

Cumulative Effects on Habitat Capability for MIS

Decreases in habitat capabilities projected to the end of the long-term timber sale contract in 2011 are similar for all alternatives including Alternative 1, the No-action Alternative, based on the assumptions stated above. Effects projected from 1995 to 2011 for each MIS were based on the average change in habitat capability anticipated under all current alternatives between 1990 and 1995. This took into account the more stringent resource protective measures currently used to design harvest units compared to earlier entries and enabled projecting effects without knowing exact locations of future harvest units.

Projected timber harvest to 2011 would result in habitat capability decreases within a 1 to 3 percent range difference between alternatives (Table 4-31). Although habitat capabilities vary by alternative in a very narrow range, Alternative 5 has the greatest cumulative impact for 6 of the 11 MIS:

- Mountain goat
- Brown creeper
- Red squirrel
- Otter
- Brown bear
- Hairy woodpecker

Table 4-31
Cumulative Changes in Habitat Capability Between 1961 and 2011 by Alternative

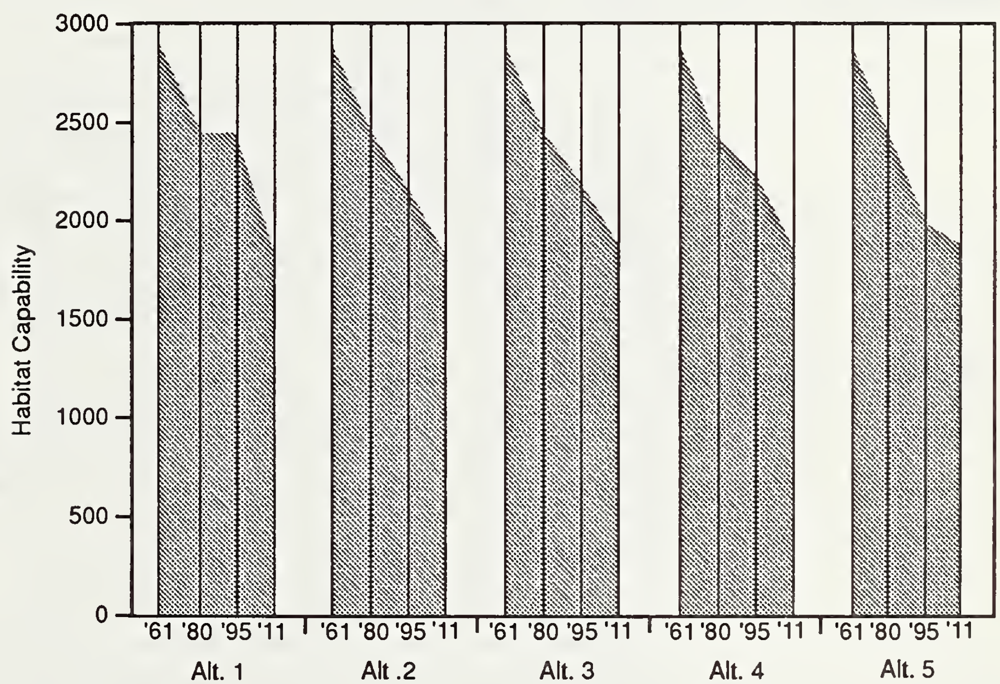
Species	Habitat Cap. in 1961	Alt. 1 Percent Change to 1995	Alt. 1 Percent Change to 2011	Alt. 2 Percent Change to 1995	Alt. 2 Percent Change to 2011	Alt. 3 Percent Change to 1995	Alt. 3 Percent Change to 2011	Alt. 4 Percent Change to 1995	Alt. 4 Percent Change to 2011	Alt. 5 Percent Change to 1995	Alt. 5 Percent Change to 2011
Sitka Black-tailed Deer	2,900	16	37	26	38	24	36	23	37	31	35
Mountain Goat	89	0	1	(1)	1	0	(1)	(1)	(1)	1	2
Brown Bear	214	3	8	5	8	5	8	4	8	7	9
Red Squirrel	83,818	5	15	11	15	10	15	9	15	15	16
Otter	119	13	14	13	14	13	14	13	14	15	15
Marten	267	9	20	14	21	14	20	12	20	19	21
Brown Creeper	1,287	58	65	62	66	60	64	60	64	66	67
Red-breasted Sap-sucker	10,758	6	22	14	22	13	22	11	22	19	22
Hairy Wood-pecker	1,189	21	36	28	36	28	36	26	36	34	37
Vancouver Canada Goose	231	0	5	3	6	(1)	3	2	6	5	6
Bald Eagle	382	15	17	16	17	16	17	15	16	17	18

Source: Weber, 1991.
Decrease in habitat capability to 1995 for Alternative 1 reflects only past timber harvest.
Parentheses ( ) indicate a value less than that displayed.

Greater impacts under Alternative 5 can probably be attributed to more harvest of Volume Classs 6 old growth (Table 4-4d), beach fringe, estuary fringe, riparian, and alpine/subalpine habitats between 1992 and 1995 than the other alternatives (Table 4-29).

Alternative 1 would postpone further decreases in habitat capabilities until after 1995 while Alternative 5 would produce most of the anticipated declines between 1990 and 1995. Alternatives 2 and 3 would more evenly distribute the decrease in habitat capabilities between the 1990-1995 and 1995-2011 entries as illustrated in Figure 4-12. Alternative 4 would result in smaller decreases in habitat capabilities between 1990-1995 than between 1995-2011. Gradual changes in habitat capability may avert degradation of remaining habitat from overuse by displaced wildlife.

Figure 4-12
Deer Habitat Capability Over Time



SOURCE: Weber, 1991.

Cumulative Effects on Biological Diversity

Although 72 percent of the old-growth stands will remain under all alternatives, very few undisturbed watersheds or extensive areas of undisturbed old growth are likely to exist in the Project Area outside of VCU 295 and possible the Glacier River watershed by 2011. Habitats should retain connectivity under guidelines for uncut beach fringe, estuary fringe, stream corridors, and unscheduled areas. MIS will remain at viable levels and well distributed throughout the Project Area although at reduced levels due to the anticipated timber harvest. The natural old-growth dominated landscape will shift towards a mosaic of young timber stands.

All alternatives would result in approximately the same proportion of successional stages by 2011. Approximately 10 percent of the Project Area would change to earlier successional stages (Tables 4-5 through 4-8). The alternatives vary primarily in the time frame in reaching those proportions. Alternative 1 would postpone 68 percent of the successional change to the next entry while Alternative 5 would project only 11 percent of the change. Alternatives 2, 3, and 4 represent 35 percent, 37 percent and 45 percent successional changes, respectively, in the next entry before 2011. Gradual successional changes would allow wildlife populations time to adapt to changes in vegetation and possibly avoid over competition and habitat degradation resulting from the temporary over population before populations reach equilibrium with habitat capability. Alternatives 2 and 3 would best provide a gradual successional change to 2011.

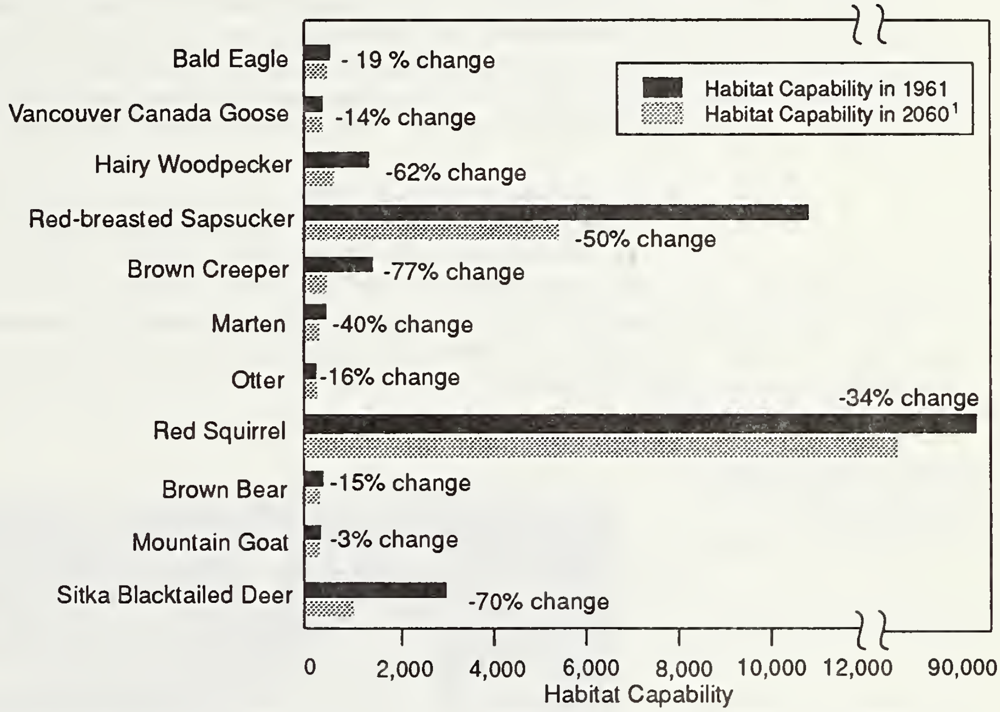
Long-term Productivity of Wildlife

Primary long-term impacts on wildlife result from loss of old-growth habitat. By 2060, the end of the first timber rotation, 32,500 acres or 64 percent of the productive old-growth in the Project Area will have been harvested if TLMP is implemented. Excluding VCU 295, which is administratively withdrawn from timber harvest, 70 percent of the productive old growth is scheduled for harvest (Weber, 1991). Species such as Sitka black-tailed deer, brown creeper, hairy woodpecker, red-breasted sapsucker and marten depend on old growth extensively at critical times of the year and will experience large decreases in habitat capability (Figure 4-13). Brown bear, otter, and bald eagle would experience much smaller decreases in habitat capabilities because of Forest Service measures that protect beach, estuary, and riparian habitats. Only a small decrease in habitat capability for mountain goat is projected because of general inaccessibility and lack of suitability for timber harvest of goat habitat. If demand for timber forces harvest into steeper, higher old-growth stands than currently considered for harvest, impacts to mountain goat would be much higher. All MIS would be above minimum viable levels and their occurrence is anticipated to remain well distributed throughout the Project Area.

These projections of habitat capability are based on current resource protective measures and changes in habitat capabilities resulting from timber harvest planned in Alternatives 2 through 5. The projected capabilities for brown bear and marten could decrease further if roads are left open and/or logging camps become long-term facilities resulting in human-related disturbance and mortality.

Canopy closure in second-growth stands at about 20 years results in reduced habitat capability for deer, marten, and brown bear but increased capability for red squirrel. This factor was not included in the projections to 2060. The changes would be small and hard to quantify because of the difficulty in projecting when future timber harvests will occur or how much will be harvested during any entry. Thinning second-growth stands can delay or set back canopy closure to offset the negative effects of maturing second-growth stands on wildlife, but it is difficult to project the quantity of thinning over the rotation and to quantify the effect on habitat capabilities.

Figure 4-13
Cumulative Changes in Habitat Capability Between 1961 and 2060



SOURCE: Weber, 1991.

[1] Decrease in habitat capability to 2060 based on the current ratio of habitat capability change to acres proposed for harvest and total acres scheduled for harvest to the end of rotation in 2060 based on the Allowable Sale Quantity (ASQ) set in the Tongass Land Management Plan.

Watershed and Fish

One of the eight major issues identified in public scoping for the EIS addressed the concern for protecting water quality in streams, which provide habitat for anadromous and resident fishes. The effects of the many land management activities on resident and anadromous fish resources are very complex, often unpredictable, and not easily quantified. Many of the activities that affect the fisheries resources are closely linked with water quality and quantity. Because of the unpredictability and lack of analytical techniques for quantifying effects, the following sections will discuss the types of effects, how they influence soil productivity, water quality, and fish production, and the risks and magnitude of the effects. The effects can occur on the hill slopes, within the portion of the stream inhabited by fish or in streams in the watershed above the fish producing stream segments. Potential effects are categorized as direct, indirect, and cumulative based on potential changes in erosion, sedimentation, stream temperature, recruitment of large woody debris, stream nutrient cycles, and impacts to MIS.

Direct and Indirect Effects

Direct Effect on Soil Physical Properties

Changes in soil physical properties can affect soil as a plant-growth media, alter its moisture retention and transmission capabilities, and change its susceptibility to erosion. With timber harvest activities in Southeast Alaska, these changes are generally slight, non-beneficial, and almost always avoidable. The proposed timber harvest activities for the Kelp Bay Project Area would likely result in minor and inconsequential soil disturbance of this form. For this reason, this type of disturbance will not be further considered.

Soil surface erosion also cannot be completely avoided under any practicable timber harvest scheme. Some surface erosion is an inevitable consequence of road construction. However, by requiring early grass seeding and fertilization, roadside erosion is significantly curtailed within the first season following road construction. Some surface disturbance from timber removal activities would also be unavoidable. Using more sophisticated yarding systems such as helicopter or full suspension live skyline, less than 3 percent of the ground may be disturbed.

Watershed and fish resources are an important consideration in all action alternatives.

Soil quality standards set the limit of acceptable soil disturbance. An area is considered to have an unacceptable level of soil disturbance when 10 percent or more of the area has exposed mineral soil, or 20 percent or more of the area is occupied by exposed mineral soil plus mixed organic and mineral soils. Soil management practices are meant to ensure that unacceptable levels of soil disturbance do not occur.

Soil management practices would be the same for all alternatives. These BMPs are described in detail in the Region 10 Soil and Water Conservation Handbook (Forest Service [D]). The intent of these practices is to minimize the risk of producing an unacceptable level (>10 percent of area harvested) of soils disturbance. Some of these practices include: split

yarding and directional timber falling away from steep V-notch sideslopes, providing either full or one-end suspension of logs over areas identified as having sensitive soils, protecting Class III and intermittent stream banks by stopping unit boundaries above the slope breaks, and maintaining a minimum 100-foot buffer to protect all Class I and Class II streams flowing into Class I streams. Mitigative measures following harvest or road construction might include grass seeding and fertilization to ensure revegetation and to fill banks and borrow pit waste areas. Soil scientist review may be requested for areas identified as having a high risk of surface disturbance from timber removal activities or on sites having a high mass wasting hazard rating.

Direct and Indirect Effects on Surface Erosion

Insufficient information is available to compare natural surface erosion disturbances with soil surface disturbance from timber removal and road construction activities. When insufficient information is available to make accurate assessments, NEPA requires a worst-case scenario to be presented (40 CFR 1502.22). A worst-case scenario does not address what is expected to occur but what is the expected worst-case situation.

The following assumptions were made for this analysis:

- Soil disturbance resulting from road construction is 6 acres/mile — average disturbance occurs 25 feet either side of the center line.

- When averaged over all harvest acres, ground disturbance will be 10 percent of the harvested area.

Based on these assumptions, soils disturbance from roading and timber harvest activities, which exceed the natural conditions in the No-action Alternative (Alternative 1) are shown in Table 4-32.

Table 4-32
Acres of Soil Surface Disturbance Resulting from Road Construction (A) and Timber Removal (B) by Alternative and VCU

VCU	Alternative 2			Alternative 3			Alternative 4			Alternative 5		
#	A	B	Total	A	B	Total	A	B	Total	A	B	Total
293	153	72	225	215	129	344	153	70	223	225	158	383
294	113	95	208	149	185	334	114	88	202	155	203	358
296	134	118	252	74	40	114	67	49	116	106	96	202
297	214	85	299	139	92	231	151	58	209	219	146	365
298	53	80	133	7	7	14	34	31	70	58	105	163
314	0	7	7	0	0	0	0	2	2	44	53	97
315	67	52	119	0	0	0	11	31	42	106	8	1187
Total	734	509	1,243	577	454	1,031	560	329	889	913	842	1,755

SOURCE: West et al., 1991.

Based on a "worst-case" analysis, the greatest increase in surface erosion would result from implementing Alternative 5, with 1,755 acres subject to erosion. This is followed in order by Alternative 2 (1,243 acres), and Alternative 3 (1,031 acres). The least effect would result from Alternative 4, with 889 acres subject to erosion in the worst case. Consequences of timber harvest would range from 3 to 20 years duration, in contrast to either mass wasting or road construction erosion.

Road Erosion

Road corridors are frequently the major source of management related sediment. Research data indicates that 80 percent or more of the sediment increases attributed to harvesting activities are associated with roads. Erosion and sedimentation from channel disturbance associated with construction of stream crossing structures, road use, and maintenance would result in small increases in sediment transfer to streams and lakes. The majority of increased sediment transfer occurs 2 to 5 years following initial road construction. Short-term (1 to 2 days) water quality degradation near construction activity is probable. However, implementation of BMPs (Forest Service [D]) for road construction and maintenance would greatly reduce the likelihood of chronic or long-term impacts to downstream water quality (sediment or turbidity) or stream channel stability.

Sediment monitoring of three small tributaries to the Kadashan River near Tenakee was undertaken to measure onsite sediment produced by construction of road drainage culverts (Paustian, 1987). The initial pulse of sediment produced during grubbing, culvert bedding, and fill placement dissipated over a 48-hour period. This sediment pulse was roughly equivalent to the sediment released during a typical fall storm event under natural conditions. Similar results were obtained from short-term monitoring of bridge and culvert placement at seven other Tenakee Inlet watersheds (Stednick, 1978). Through proper implementation of BMPs, the effects of road erosion on water quality should be negligible for all action alternatives.

Streambank and Channel Erosion

Riparian vegetation has a very important function of maintaining streambank and floodplain stability (Meehan et al., 1977). Riparian vegetation delays the movement of sediment and woody debris within floodplains. The root mats of streamside vegetation have a critical role in maintaining streambank structure and controlling streambank erosion. Harvesting riparian timber would likely have direct consequences on fish habitat productivity.

Implementation of the Tongass Timber Reform Act would eliminate streamside harvest activity on Class I anadromous fish streams and along most Class II resident fish streams. This management approach should result in minimal changes to stream morphology and fish habitat conditions in these streams. Riparian harvesting restrictions are designed to minimize impacts related to streambank disturbance, canopy alteration, and large woody debris recruitment. Blowdown of riparian buffer strips may result in increased bank erosion and possibly increase channel migration in localized Class I and Class II channel segments. Channel shifting from debris accumulations or changes in sediment load (bedload deposition) may reduce the effectiveness of narrow riparian buffer strips in naturally unstable floodplains and alluvial fan streams over time. However, little information presently exists to assess the long-term effectiveness of riparian buffer strips in Southeast Alaska.

In some instances, clearcut harvesting adjacent to water quality streams (Value Class III) may result in reduced large woody debris recruitment and a net reduction to instream log step pools over time. Sediment storage capacity would subsequently be reduced over time in these channel reaches, potentially resulting in more rapid routing of bedload sediment to downstream areas. The downstream effects of changes in coarse sediment routing are unknown. Upper bank erosion may also increase adjacent to Class III V-notch channels following harvest because of windthrow of V-notch timber.

Implementation of BMPs for harvest units that encroach on riparian areas along water quality streams (Value Class III streams) would also greatly reduce the potential for sediment transfer to downstream Class I and Class II fish streams. In most instances, current unit design stops unit boundaries on the slope break above Class III streams. The overall effect of all action alternatives on streambank and channel erosion should be negligible.

Direct and Indirect Effects of Mass Wasting Erosion

Some degree of soil disturbance is unavoidable under any reasonably practicable timber harvest activity. For the Kelp Bay Project Area, 11 percent of the land base occurs on soils inventoried as having an extreme mass wasting hazard. These soils are exempt from timber harvest. An additional 28 percent of the forest land base occurs on soils inventoried as having high mass hazard ratings. Of the total forested area, about one-half occurs on soils with a mass hazard rating of extreme or high (this amount is similar throughout the Chatham Area of the Tongass National Forest). If timber harvest is to meet contractual commitments, some harvest must occur on soil units having high mass movement hazard ratings.

Road construction and timber harvesting activities would increase the risk for mass wasting events such as debris torrents in Class III channels and debris avalanches from unstable mountain sideslopes. Although only a small percentage (3 percent) of natural and management induced mass wasting would directly impact fish streams (Swanston, 1991), accelerated erosion and sedimentation from management activities would likely result in localized degradation of spawning gravels and fish rearing habitat. Data from a regionwide landslide survey estimates that landslide (mostly small scale mass wasting events) occurrence has increased five-fold in harvested areas.

The potential for mass wasting related impacts to Class III upland channels would vary somewhat for affected individual stream channel segments. Most impacts can be substantially mitigated by limiting the type and extent of harvest activities that take place immediately adjacent to channel banks and ravine sideslopes. In most cases, harvesting would not take place within ravine sideslopes adjacent to incised upland stream channels; therefore, changes in sediment delivery and large woody debris recruitment would be minimized. However, increased susceptibility to blowdown on gully sideslopes following harvest of adjacent timber stands may substantially reduce the effectiveness of this mitigative strategy in some areas. Little information presently exists to assess blowdown risk specific to localized geography and topography within the Kelp Bay Project Area. The effects of accelerated mass wasting in gully channels and headwater areas on channel stability and habitat capability in downstream Class I stream segments are also not well understood for this region. Timber harvesting and road construction activities on high hazard soils would be limited under all proposed harvest alternatives in the Kelp Bay Project Area.

Landslide Occurrence

Increase in the incidence of mass wasting over natural occurrences (No-action Alternative) can be evaluated by assuming a five-fold increase over natural occurrences on managed acres (Swanston, 1989). Results of such evaluation for the Kelp Bay Project Area are shown in Table 4-33.

Table 4-33
Percent Increase Over Natural in Potential Landslides Relative to No-action Alternative (Worst-Case)

VCU	Alt. 2	Alt. 3	Alt. 4	Alt. 5
293	14	50	18	654
294	22	47	27	55
296	22	4	9	17
297	4	4	1	6
298	19	0	1	19
314	0	0	0	4
315	6	0	2	6
Total	15	14	9	25

SOURCE: West et al., 1991.

Alternative 5 would have the greatest potential increase (25 percent) in mass wasting over the No-action Alternative; Alternative 4 has the least increase (9 percent). Alternatives 2 and 3 are about the same, representing increases of approximately 15 and 14 percent. The potential increase under Alternative 5 would be a moderate impact while increases under Alternatives 2 and 3 would be minor. Potential increase in mass wasting under Alternative 4 would be negligible.

The following analysis displays the relative risk to water quality associated with mass wasting for each timber harvesting alternative. There is a low potential for significant impacts to water quality and fish habitat from management-induced mass wasting events if any of the action alternatives are implemented. The results of a recently completed Tongass-wide landslide survey can help illustrate the potential for mass wasting impacts in the Kelp Bay Project Area (Swanston and Marion, 1991). This regional landslide survey, which included only large mass wasting events greater than 100 cu yd soil displacement, estimates a natural landslide rate of .93 over 20 years for an area the size of Kelp Bay. Following timber harvesting, this landslide rate would be expected to increase to 3.3 slides over a 20-year period. However, these results also indicate that a relatively small percentage of sediment generated from large wasting events will reach a stream.

The Tongass landslide survey categorized 23 percent of all landslides as debris torrents that occur with incised V-notch gullies. It can be inferred that the majority of these debris torrents impact Class III stream channels. Indirect effects of these kind of events on downstream Class I or II channels are not certain but some significant short-term impacts (1 to 2 years) to fish habitat would be likely. Only about 3 percent of all natural and management-induced slide events in this survey directly impacted Class I streams. Long-term impact (greater than 10 years) to fish habitat would be anticipated for Class I channel segments directly affected by a large landslide. Based on Swanston's results, there is about a one-in-four chance that any management-related landslides will have a major impact on perennial streams and only a very slight chance that major impacts on fish habitat would occur.

Care should be taken in extrapolating these results to the Kelp Bay area. Road construction and harvesting technology changes, as well as a greater sensitivity to water quality and fish habitat concerns, have resulted in improved management practices for timber operations in landslide prone areas. These factors would tend to reduce management-related landslide incidences in the Kelp Bay sale from the natural rate observed by Swanston (3.5 times). On the other hand, many of the areas included in Swanston's survey had road systems that were predominantly located on stable locations on lower valley slopes. Several road segments in the Kelp Bay Project Area are proposed on relatively steep slopes. This factor would tend to increase the potential incidence of road-related mass wasting events. Because of these limitations, a more precise prediction of the incidence of mass wasting for the various Kelp Bay alternatives cannot be made. Table 4-33 portrays an average to worst case scenario of landslides.

Road Construction

The potential risk of sediment transfer from mass wasting events associated with roads was analyzed for each VCU using an approach similar to that described by Hogan (1989). The analysis reports the mileage of roads with high sediment delivery potential to Value Class I anadromous fish streams and to shorelines. Sediment delivery to Class I streams is broken down into two separate categories: potential direct delivery to Class I streams (Table 4-34) and potential indirect delivery to Class I streams from Class II or III tributaries (Table 4-35). Potential sediment delivery to saltwater shorelines is summarized in Table 4-36.

Table 4-34
Miles of Road with Direct Sediment Delivery Potential to Class I Streams by Alternative

VCU	Alt 1 Miles	Alt 2 Miles	Alt 3 Miles	Alt 4 Miles	Alt 5 Miles
293	0.0	1.8	1.8	1.5	1.8
294	0.0	1.1	1.4	1.1	1.4
295	0.0	0.0	0.0	0.0	0.0
296	0.0	5.1	1.3	1.3	3.7
297	0.0	1.2	0.9	0.7	1.4
298	0.0	0.0	0.0	0.0	0.0
314	0.0	0.0	0.0	0.0	0.0
315	0.0	0.0	0.0	0.0	0.0
Total	0.0	9.2	5.4	4.6	8.3
Percent of Total Miles	0	7.6	5.7	5.3	5.5

SOURCE: Paustian et al., 1991.

Table 4-35
Miles of Road with Indirect Sediment Delivery Potential to Class I Streams from Class II or III Streams by Alternative

VCU	Alt 1 Miles	Alt 2 Miles	Alt 3 Miles	Alt 4 Miles	Alt 5 Miles
293	0.0	6.0	8.5	6.8	8.8
294	0.0	6.3	7.6	6.3	7.8
295	0.0	0.0	0.0	0.0	0.0
296	0.0	1.9	1.4	1.4	1.7
297	0.0	7.2	5.1	5.9	7.9
298	0.0	0.6	0.0	0.5	0.7
314	0.0	0.0	0.0	0.0	0.7
315	0.0	2.6	0.0	0.0	3.1
Total	0.0	24.6	22.6	20.9	30.7
Percent of Total Miles	0	20.5	23.8	24.3	20.4

SOURCE: Paustian et al., 1991.

Alternative 2 with 9.2 miles and Alternative 5 with 8.3 miles have the most mileage of roads with potential sediment delivery directly to Class I channels (Table 4-36). Alternative 3 has an intermediate amount, 5.4 miles of roads, with direct sediment delivery risk to Class I channels, and Alternative 4 has the least high risk roads in this category with 4.6 miles. Based on the percentage of total miles, Alternative 2 is slightly higher than the remaining action alternatives.

Potential indirect sediment delivery risk to Class I streams is highest for Alternative 5 with 30.7 miles, followed by Alternative 2 with 24.6 miles, Alternative 3 with 22.6 miles, and Alternative 4 with 20.9 miles. Based on percentage of development to total miles, all alternatives are similar ranging from 20.4 to 24.3 percent of roads at risk of producing sediment. The overall impact of potential sediment risk from roads in the Project Area on fish habitat is negligible for each action alternative.

Table 4-36 summarizes the potential sediment delivery risk from roads to saltwater habitats. Alternative 5 has the most high risk road mileage, 13.3 miles, followed by Alternative 2 with 8.9 miles, Alternative 4 with 5.8 miles, and Alternative 3 with 4.8 miles. Percentages are consistent with the acres of road with potential sediment delivery.

Table 4-36

Miles of Road with Delivery Potential to Saltwater by Alternative

VCU	Alt 1 Miles	Alt 2 Miles	Alt 3 Miles	Alt 4 Miles	Alt 5 Miles
293	0.0	1.4	1.5	1.5	2.2
294	0.0	1.0	1.0	1.0	1.1
295	0.0	0.0	0.0	0.0	0.0
296	0.0	1.4	0.9	0.9	0.6
297	0.0	1.8	1.4	2.0	2.6
298	0.0	0.4	0.0	0.4	0.5
314	0.0	0.0	0.0	0.0	1.4
315	0.0	2.9	0.0	0.0	4.9
Total	0.0	8.9	4.8	5.8	13.3
Percent of Total Miles	0	7.4	5.1	6.7	8.8

SOURCE: Paustian et al., 1991.

Timber Harvest

Tables 4-37, 4-38, and 4-39 summarize high risk areas for potential direct sediment delivery to anadromous streams (Value Class I), potential indirect sediment delivery to anadromous streams, and potential direct delivery to saltwater habitat associated with proposed harvest units. The relative risk of sediment transfer to waterbodies is determined using the same approach as sediment delivery from roads.

Table 4-37
Acres of High Hazard Soils with Potential Direct Sediment Delivery to Class I Streams by Alternative

VCU	Alt 1 Acres	Alt 2 Acres	Alt 3 Acres	Alt 4 Acres	Alt 5 Acres
293	0	0	60	0	116
294	0	136	466	264	404
295	0	0	0	0	0
296	0	342	2	83	411
297	0	0	18	18	18
298	0	224	0	0	224
314	0	0	0	0	17
315	0	31	0	2	31
Total	0	733	546	367	1221
Percent of Total Harvest	0	14.4	12.0	11.2	14.5

SOURCE: Paustian et al., 1991.

Table 4-38
Acres of High Hazard Soil with Indirect Sediment Delivery Potential to Class I Streams by Alternative

VCU	Alt 1 Acres	Alt 2 Acres	Alt 3 Acres	Alt 4 Acres	Alt 5 Acres
293	0	70	287	107	319
294	0	256	456	254	552
295	0	0	0	0	0
296	0	131	44	84	46
297	0	49	55	7	7
298	0	64	0	28	71
314	0	0	0	0	46
315	0	132	0	74	132
Total	0	702	842	554	1,173
Percent of Total Harvest	0	13.8	18.5	16.8	13.9

SOURCE: Paustian et al., 1991.

Table 4-39

Acres of High Hazard Soil with Sediment Delivery Potential to Saltwater by Alternative

VCU	Alt 1 Acres	Alt 2 Acres	Alt 3 Acres	Alt 4 Acres	Alt 5 Acres
293	0	10	10	10	38
294	0	16	16	16	100
295	0	0	0	0	0
296	0	112	41	70	25
297	0	24	0	24	58
298	0	149	0	46	149
314	0	0	0	0	45
315	0	87	0	73	87
Total	0	398	67	239	502
Percent of Total Harvest	0	7.8	1.5	7.2	5.9

SOURCE: Paustian et al., 1991.

Alternative 5 has the most acreage with high sediment transfer risk (1,221 acres), followed by Alternative 2 (733 acres), Alternative 3 (546 acres), and Alternative 4 (367 acres). When comparing acres of potential risk with total proposed harvest, Alternatives 2 and 5 are essentially the same, and only slightly more at risk than Alternatives 3 and 4.

Risk of indirect sediment delivery to Class I streams in order of magnitude are Alternative 5 (1,173 acres), Alternative 3 (842 acres), Alternative 2 (702 acres), and Alternative 4 (554 acres). When comparing acres of potential sediment delivery to thte total proposed for harvest, Alternative 3, followed closely by Alternative 4, has a higher percentage of sediment risk than Alternatives 2 or 5, which are roughly 3 to 4 percent less.

Potential sediment transfer risk to saltwater in order of magnitude are Alternative 5 (502 acres), Alternative 2 (398 acres), Alternative 4 (239 acres), and Alternative 3 (67 acres). When comparing the acres with potential for sediment delivery with the total proposed for harvest, Alternative 3 has the lowest percentage of inducing sediment into saltwater. Alternative 2 and 4 have the greatest percentage of risk, with Alternative 5 falling in between. The overall impact of potential sediment transfer from harvest units in the Project Area would be minor for each action alternative.

Direct and Indirect Effects of Sediment

Increases in sediment delivery to streams above naturally occurring rates result from management activities. Erosion from disturbed ground in harvest units, road construction, and road use are the most common sources, as discussed in the previous two sections. Potential consequences to fish and water quality of high sediment loads include degradation of spawning gravel, channel widening, loss of undercut bank habitat, loss of pool habitat, and channel dewatering. These affect habitat quality for adult salmon, char, and trout, as well as for rearing juvenile salmonids.

Sediment would be generated in each action alternative from short- and long-term land disturbing activities. Sediment generation and delivery to streams is roughly proportional to the amount of road constructed, the amount of use, the number of stream crossings, the proximity of road to the stream, and the area of high hazard soils disturbed. Construction of new roads exposes soil to erosion, and the soil often delivered to streams. Clearing and grading for bridges and culverts can increase sediment delivery to streams, as can timber harvest within streamside riparian areas. Logging on high hazard soils occasionally generates large quantities of sediment from landslides that, in a few instances, may directly impact streams.

Sediment from management activities continues to be generated long after roads are constructed, units are harvested, and stream crossings are in place. Traffic grinds road surface materials to fine particles which are transported to ditches and stream channels. Maintenance of roads and ditches continually exposes soil to the elements, generating additional fine material. As use subsides and exposed soil becomes covered with vegetation, the rate of soil displacement and delivery to stream channels is generally reduced. The rate and extent of the reduction depends greatly on the speed of vegetative establishment. In the case of roads, much depends on whether the road is seeded and closed, or remains open to traffic.

The extent to which stream crossings deliver sediment to channels depends on the maintenance strategy applied after harvest. If culverts and bridges continue to be maintained, little additional sediment is delivered to channels. If culverts and bridges are left in place and not regularly maintained, large pulses of sediment can be delivered downstream if these structures fail. Removal of culverts and bridges, and restoration of the original channel configuration would generate some short-term sediment which would be greatly reduced over time.

Two classes of road maintenance are proposed for the Kelp Bay Project Area: the first includes temporary and short-term roads, and the second is long-term or forest development roads. Short-term and temporary roads are closed once the proposed logging is complete. The drainage structures are removed, and the roadway is seeded to control erosion and allowed to deteriorate. This class of road has the least risk of sediment sources to streams and other water bodies. The long-term road network would be maintained beyond the life of the timber sale, and most of these roads would be used intermittently between harvest entries, thus having a potential for long-term sources of sediment. Long-term roads are also scheduled to be seeded and fertilized between use to reduce surface erosion. Table 4-40 lists the mileage of temporary, short-term, and long-term roads for the various proposed alternatives.

Table 4-40
Road Management Strategy Post Harvest Access Road Miles

	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5
Long-term Roads (Maintenance Levels 1 and 2)	0.0	83.6	54.6	61.8	75.8
Short-term Road (Maintenance Level 1)	0.0	19.4	23.2	12.8	45.7
Temporary Road	0.0	16.9	17.3	11.6	28.6
Total	0.0	119.9	95.1	86.2	150.1

SOURCE: Costa, 1991.

Alternatives 2 and 5 have significantly more long-term roads and, therefore, have the highest potential risk for long term sediment production. Alternative 3 has the lowest amount of long-term road mileage (54.6 miles).

The total number of stream crossings with potential for failure on long-term roads in the Project Area are listed in Table 4-41. These potential stream crossing failures were determined from channel type inventory information and indicate which drainage structures have a higher potential for failure because of high bedload, debris transport, or mass wasting events than other structures. Alternatives 2 and 5, with the most road mileage, also have higher potential for impacts to water quality and fish habitat from road drainage structures washing out. Alternative 4 has the least potential impacts associated with long-term drainage structures. Through the IDT process, these crossings were identified and addressed on the Road Cards (see Appendix E). The long-term effects of road drainage system failure on water quality should be minor if road maintenance BMPs are implemented.

Table 4-41
Number of Potential Drainage Structure Failures by Alternative (1995 - 2011)

	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5
Number of Potential Failures	0	30	22	14	40

SOURCE: Paustian and Starostka, 1991.

Direct and Indirect Effects of Temperature Change or Dissolved Oxygen Depletion

Timber harvesting in Class III riparian areas is expected to result in minor changes to the stream temperature regimen of Kelp Bay Project Area streams. By maintaining 100-foot-minimum buffer strips adjacent to Class I and most Class II streams, the effects of harvesting small headwater drainages would be substantially mitigated. A 50- to 80-foot-wide stream-side leave strip has proven to be effective in attenuating solar radiation and reducing stream temperature increases (Brown et al., 1971). Stream temperatures in northern Southeast Alaska do not generally exceed the maximum temperature threshold of 20°C set by State water quality criteria. No watersheds in the Project Area have been designated as potentially temperature sensitive.

The majority of Class III drainages in the Project Area have source areas in alpine cirque or middle- to high-elevation mountain slopes. Consequently, these drainages tend to be clear and are moderately to deeply incised channels with high flow velocities. These streams do not meet the temperature sensitive criteria, and it is unlikely that significant increases in summer stream temperatures would occur in downstream Class I and II channels as a result of timber harvest in these headwater drainages. Effects of timber harvesting and road construction on stream temperatures and dissolved oxygen are expected to be negligible for all alternatives.

Direct and Indirect Effects to Soil Productivity

Loss of soil productivity is a direct consequence of any soil disturbance. In Southeast Alaska, the plant nutrient supply is contained primarily within the soil organic component. Removing, burying, or mixing the soil organic mat with the mineral component of soil makes these nutrients less available to plants, and also more susceptible to leaching losses. Removing and/or translocating the protective organic mat by surface disturbances and road construction, which exposes mineral soils to erosion, is a direct effect. Loss of productivity and exposure to erosive forces may be short term (1 to 3 years) if the disturbances are contained within small areas or if the areas are treated with fertilizer and groundcover seed.

Direct and Indirect Effects to Riparian Areas

Table 4-42 lists and summarizes the amount of riparian area impacted by road construction within the three AHMU stream classes (Class I, II, III). All existing road reconstruction, all proposed roads, and all temporary spur roads are included. Total acres of riparian area affected are reported and summed for each stream class, and alternative. The numbers for riparian area affected are generated by multiplying the standard road corridor width (50 feet) by the length of road and bridge crossing through the riparian area and by converting that product to acres.

Alternative 5 has the highest amount (54.9 acres) of total riparian area affected by road crossings. This alternative contains the highest amount (17.1 acres) of Class I affected area. Alternative 2 has the next highest amount (42.8 acres) of riparian area affected. Class I area affected totals 14.1 acres. Alternative 3 has the second lowest total (29.8 acres) of riparian area affected. Class I riparian area affected equals 10.2 acres which is 2.3 acres greater than Class I riparian area in Alternative 4. Alternative 4 has the lowest amount (26.8 acres) of total riparian area affected. In this alternative, 7.8 acres of Class I riparian area are affected.

Table 4-42
Acres of Road Crossing in Riparian Area by Alternative

Riparian Area	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5
Class I Streams	0.0	14.1	10.2	7.8	17.1
Class II Streams	0.0	12.8	8.1	10.5	15.6
Class III Streams	0.0	15.9	11.5	8.5	22.2
Total Acres	0.0	42.8	29.8	26.8	54.9

SOURCE: Paustian and Starostka, 1991.

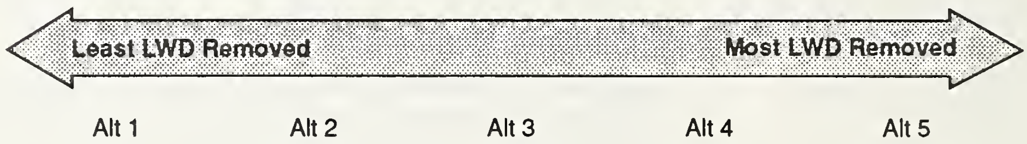
The Project Area-wide impacts from road crossings in riparian areas on fish habitat and water quality would be negligible for each action alternative.

Direct and Indirect Effects of Large Woody Debris (LWD)

Stable pieces of large wood in the stream channels are among the primary fish habitat-producing components on the forest. LWD and associated organic matter provide energy and habitat structure for fish and aquatic invertebrates and influence such physical factors as sediment storage and channel development. Management activities can influence the amount and rate of LWD recruitment to the stream. The direct effect of reduced large wood input is lower habitat quality. As complexity and diversity of habitat is reduced, fish production is also reduced.

Habitat affected by LWD would be reduced at points where roads cross Class I, II and III streams, and Class III stream channels where removal of larger wood can occur. In general, those alternatives which harvest the greatest volume would affect LWD because more roads and harvest units would be required (Figure 4-14).

Figure 4-14
Relative Rating of LWD Loss by Alternative Based Total Volume of Timber Harvested



SOURCE: Paustian and Starostka, 1991.

One direct effect that occurs when roads cross stream channels is the removal of LWD as the right-of-way is cleared to provide for culverts or bridges. Where roads cross Class I and II streams, habitat is lost immediately when wood is removed as part of the clearing process. In addition, hazard trees (trees likely to fall onto the road or stream crossing structure) are often cleared farther than 50 feet either side of the road, which can reduce the probability of being recruited as LWD to the stream. Class III streams, while not inhabited by fish, influence downstream fish bearing streams by providing insect drift and nutrients. Buffer strips are not required on Class III streams; therefore, merchantable timber may be removed from the upper stream banks and, occasionally, the channel. This removal can disrupt aquatic insect and nutrient delivery downstream and mobilize stored channel sediments.

In addition to the direct effects of road crossings, there may also be long-term indirect effects of these crossings. Habitat loss where roads cross Class I and II streams would continue as long as the crossing is maintained. This loss would be sustained as long as material is not allowed to accumulate in the channel. LWD removed as hazard trees would not be available to the stream channel as a future source of LWD. Loss of LWD from Class III channels would last for at least the length of the timber rotation.

Direct and Indirect Effects on Stream Flow

Timber harvesting can potentially affect streamflow regimens by increasing the frequency and magnitude of peak storm discharges, by increasing summer base flows immediately following harvest, and by decreasing stream base flow through changes in canopy structure or stand density. Forest vegetation influences stream runoff through transpiration of water as part of the photosynthesis process, and through interception and evaporation of precipitation from the forest canopy. Extensive clearcut blocks may alter runoff through changes in snow storage and snowmelt timing. It is conceivable that stream runoff can also be affected through conversion of old-growth forest to denser, second-growth forest, thereby increasing transpiration losses and depressing baseflow runoff during the growing season.

Direct effects can include scoured eggs from gravel, increased sediment mobilization from the streambed, increased bank erosion, and removal of habitat forming elements such as large wood and boulders. The potential for reductions in fish production exists when flows increase over normal high flows.

Much scientific literature exists about the effects of timber harvesting on water yield from forested stream basins. A compendium of these research results indicates that a minimum harvest level of 25 to 35 percent of a drainage basin is generally required before water yield increases by measurable amounts. Water yield studies in the Pacific Northwest have shown a 25 percent average increase in annual water yield for 5 to 10 years following 25 to 100 percent clearcut harvest of the study watersheds (Rothacker, 1965; 1970; Rothacker et al., 1967; and Harr, 1976, 1983). No increases in fall peak flows have been observed in rain dominated, coastal watersheds, except in cases where a high percentage of a watershed is compacted by roads and skid trails. Recent studies in the Pacific Northwest have shown that harvesting in the transient snow zone has increased the magnitude of winter peak runoff events in the Cascade Mountains of Oregon (Christner and Harr, 1982; Harr, 1981).

Water yield responses to timber harvest activities have received very little study in Southeast Alaska watersheds. No measurable changes in streamflow were observed in the Maybeso watershed following clearcutting of 25 percent of the drainage basin (Meehan et al., 1969). An analysis of the Staney Creek drainage basin following a 35 percent clearcut harvest did show significant increases in summer low flows (Bartos, 1989). Myren and Ellis (1984) have speculated that converting portions of old-growth watersheds to second-growth forests may reduce summer low flows in Southeast Alaska streams and, as a consequence, impair summer rearing and spawning for salmonids. Current state-of-the-art knowledge does not allow us to accurately predict flow change or validate streamflow response models. Several variables (elevation, aspect, basin geomorphology, soils, vegetation cover, geology, snow storage and precipitation patterns, cutting unit size, distribution of units within the watershed, and scheduling of harvest entries) could all greatly influence stream runoff.

BMPs applied in the Kelp Bay Project Area would reduce the potential for deleterious changes in streamflow regimens. By not harvesting in Class I and II riparian areas that are the major source area for summer baseflow, the potential for reducing summer lowflows and reducing summer rearing and spawning habitat for salmonids should be low. Where harvest units are dispersed throughout a drainage basin, the potential for increasing the frequency of destructive rain or snow flood events should lessen. By scheduling harvest entries 20 to 30 years apart, the potential for measurable changes in runoff associated with changing vegetation cover type should also be less.

Direct and Indirect Effects on Stream Nutrient Cycling

Timber harvesting can result in deleterious concentrations of dissolved solutes being flushed into surface waterbodies (Chamberlin, 1982). High concentrations of dissolved nutrients that impair drinking water or aquatic nutrient cycling are of principal concern. Research on the Hubbard Brook experimental forest in New England measured increases in dissolved nutrient concentrations resulting from clearcutting, slash burning, and herbicide treatments in small catchments (Pierce et al., 1972). However, similar research on coastal forest watersheds measured only slight releases of key dissolved nutrients resulting from clearcutting and slash burning treatments (Fredriksen, 1971). In Southeast forest ecosystems, dissolved nutrients are tightly bound by soil organic matter and plant root hairs. Soil and water chemistry monitoring on a small subbasin that was clearcut and burned in the Pavlof drainage near Tenakee, Alaska, measured no loss in total nitrogen and only slight leaching of potassium, magnesium, and phosphorus into surface waters (Stednick et al., 1982). The results of these investigations indicate that no measurable effects to chemical water quality or aquatic productivity would occur as the result of clearcut harvesting in the Kelp Bay Project Area.

Direct and Indirect Effects on Habitat Capability for the Fish Management Indicator Species

As discussed in Chapter 3, pink salmon, coho salmon, and Dolly Varden Char have been designated MIS. These species depend on spawning and rearing habitat to complete their life cycles. The quality and quantity of habitat on Forest lands determines, to a great degree, the harvestable surplus available to the various user groups.

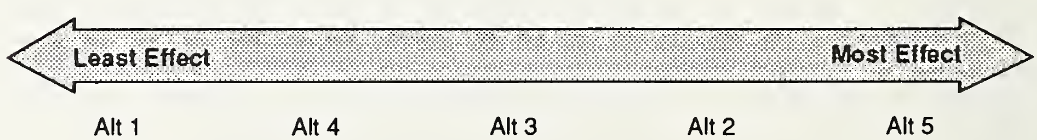
Pink salmon habitat capability relies on survival in the spawning gravels during the egg incubation period. A number of studies have shown a relationship between egg survival and water quality criteria, including intergravel sediment, temperature, water flow, and other factors (Reiser and Bjornn, 1979).

Studies and analyses of Southeast Alaska's pink salmon including relationships between instream sediment, egg survival, and pink salmon returns to streams have been conducted (Sheridan et al., 1984; Pella and Myren, 1974; Sheridan, 1982). None of these studies have provided a conclusive link between upland management and reduced numbers of returning fish. This may be because of the sensitivity of the biological investigations or because other limiting factors (for example, ocean survival) may be more significant than those in the fresh water life stage.

While a direct link has not been established for pink salmon in Alaska but has been for other salmonids elsewhere, it would be prudent to minimize sediment delivery to pink salmon streams. The establishment of BMPs seeks to minimize sediment generation and delivery to streams. The implementation of BMPs and legislation establishing buffer strips should minimize sediment impacts but differences between alternatives are likely to exist.

Those alternatives having greater portions of high hazard soils would have the most potential for sediment deliverable to Class I streams. A summary of the relative rating of alternatives is found in Figure 4-15.

Figure 4-15
Relative Rating of Alternatives for Potential Effects on FISH MIS



SOURCE: Paustian and Starostka, 1991.

Streamside timber harvest is not permitted along all Class I streams or Class II streams that flow into Class I streams. This should result in minimal change to fish habitat in these streams.

Coho salmon (Class I) and resident Dolly Varden (Class II) habitat capability is dependent not only on available spawning area but on rearing area as well. Coho juveniles spend up to 3 years in fresh water; Dolly Varden may spend their entire lives in fresh water. During this time both species rely on habitat structure for hiding and survival cover. A large part of this cover is provided by LWD. It is generally accepted that the rearing phase of these species' life cycle is the most limiting (Murphy et al., 1986).

Those alternatives that remove the most LWD would most likely reduce habitat capability the greatest. LWD removal would only occur at stream crossings because BMPs and buffer strips would maintain habitat in Class I and Class II streams flowing into Class I streams. Road construction at some stream crossings would remove little or no LWD because not all stream reaches contain LWD. A relative rating of effects on fish MIS is shown in Figure 4-15.

It is not anticipated that habitat capability for the fish MIS would be greatly affected by any of the proposed alternatives based on the application of BMPs and 100-foot-minimum buffer strips as prescribed by the Tongass Timber Reform Act.

Direct and Indirect Effects on Demand for Fisheries

Demand and competition for fisheries resources is expected to increase as more people enter the area and access is improved. The Project Area is a popular recreational area. The Lake Eva cabin is popular with 780 recreation visitor days (RVDs) use in 1989. This represents an occupancy rate of 87 percent. Recreational boaters are common but only 8, good, overnight anchorages exist within the Project Area.

People from logging camps would be occupying portions of the area on a semi-permanent basis for up to 4 years. This occupation would tend to compete with other users and reduce those fishery resources.

Direct effects of camp occupation during road construction and logging include harvest and disturbance of fish. Three to nine camps would be set up, with 10 to 30 people each, depending on the alternative. This number of people with direct access to the fisheries resource would increase the harvest of marine and freshwater species. Competition for species in high demand, such as sockeye salmon, could be intense and would displace traditional users. Some of the LTF camps would be near streams where fish would be subjected to higher exploitation than streams farther away. Increased road access would allow sport fishing in previously remote streams and lakes by camp inhabitants and other users. As the quality of angling decreases in heavily fished waters, unauthorized stocking of non-endemic fish species into inhabited and barren waters may occur.

Most indirect effects would be associated with increased access created by the road system. Increased use of the roads would attract people who would put more demands on the fisheries resource.

Comparison of Alternatives

Increased stream sedimentation in the Kelp Bay Project Area is likely to result from timber harvest and road construction on high hazard soils. Sediment would also be generated by road construction in riparian areas and from erosion of drainage facilities of long-term forest roads. Direct and indirect effects of stream sedimentation may include some loss or impairment of resident and anadromous fish spawning and rearing habitat. A relative rating for management generated sediment for proposed alternatives, from least risk of increased sediment to highest risk of increased sediment, is displayed in Figure 4-15. The overall impact from sedimentation would be minor for each action alternative.

In Alternative 1 (No-action Alternative) the situation would remain similar to what it is today. No further soil disturbance from management activities would occur and sediment generation would not increase over present levels.

Alternative 4 has the fewest miles of new road constructed, the least riparian acreage impacted by roads, and the fewest acres harvested on potentially high hazard soils. In addition, this alternative has the fewest miles of road delivering sediment directly to Class I streams, and the fewest road miles contributing sediment to Class I streams via Class II and III streams. Road reconstruction miles are the same as Alternative 2, more than Alternative 3, and less than Alternative 5. This alternative does not enter Twin Lakes, Cosmos Cove, or Clear River, and only the upper tributaries of the Local Creek drainage. It would most likely generate the least sediment impacts of the action alternatives.

Alternative 3 concentrates harvest along Peril Strait. It has the fewest miles of road reconstruction, second to the fewest miles of new construction and acres of hazardous soils harvested, fewest miles of road delivering sediment directly to Class I streams, and the fewest miles of road delivering sediment to Class I streams via Class II and III streams. It also has the fewest worker camps and LTFs. This Alternative does not enter Twin Lakes or the southern portion of Catherine Island. It would, most likely, generate the second to the least sediment impacts.

Alternative 2 attempts to distribute impacts across the Project Area and, in doing so, enters most of the drainages. It has the second greatest amount of new road construction, the same amount of reconstruction as Alternative 4, the second highest acreage of hazardous soils

disturbed and delivery of sediment to Class I streams via Class II and III streams, and the greatest number of miles of roads delivering sediment directly to Class I streams. It has the same number of worker camps as Alternative 5 (which is the highest) and the second greatest number of LTFs. It enters most drainages, including Twin Lakes, Portage Arm, southern Catherine Island, Bourbon Creek, and Cosmos Cove.

Alternative 5 harvests the greatest volume of timber which results in the most ground disturbing activities. It accesses most of the available timber in the area, except for southern Catherine Island and Portage Arm. This alternative has the greatest mileage of road construction and timber harvest on hazardous soils and some of the highest sediment delivery potential to streams. Alternative 5 and Alternative 2 have the most worker camps and LTFs. Alternative 5 would most likely generate the most sediment.

No significant changes in stream temperature regimens, large woody debris recruitment, or stream nutrient cycles are expected as a result of timber harvesting activities planned in Project Area watersheds. Riparian management prescriptions should minimize water quality and fish habitat concerns associated with these issues.

Demand for fisheries resources, specifically sport fisheries, would increase as a result of resident camp facilities and improved road access to fishing streams and lakes. This may have an impact on the sport fisheries during and shortly following the completion of logging operations.

Cumulative Effects

Up to this point, the discussion has been of individual impacts mostly in the short-term. These impacts, however, can affect each other in various combinations over the long term. They can be more important in those drainages previously entered and may increase the effects of future roading and logging.

Soil

It is anticipated that in order to meet APC contractual commitments, all VCUs (except VCU 295) within the Kelp Bay Project Area would be re-entered for harvest before the end of the contract period (year 2011). The intensity of timber harvest for the next entry depends upon the alternative chosen. Cumulative impacts for the Kelp Bay Project Area may be assessed by making certain assumptions regarding re-entry timing and intensity, and behavior of soils regarding adjustment to the disturbances.

Assumptions regarding timing and intensity of the re-entry are:

- The next entry into the Project Area will occur before 2011;
- Timber volume suitable for harvest not harvested in previous entries will be harvested during this entry; and
- All timber harvesting activities will be started and completed within the same year. (It is recognized that this third assumption is probably unrealistic; however, its application will have only minor effects on the overall assessment, and it significantly simplifies the assessment process.)

Assumptions regarding behavior of soils to disturbances are based primarily on unpublished Forest Service surveys and observations and are corroborated by Forest Service employees (Personal communication, February 1991, Fred Glenn, Soil Scientist; Randy West, Soil Scientist; and Doug Swanston, Geologist). Cumulatively, these three employees account for more than 50 years of experience in Southeast Alaska. Taken in the context of this analysis, the following tables show what is considered to be a "worst-case" situation.

Figures 4-16 through 4-20 illustrate the predicted acres of soil disturbance resulting from natural and induced mass wasting (MW), timber removal and natural surface disturbance (SD), and roading surface disturbance (RD) by alternative for the years 1990, 1995, and 2011. While the above assumptions represents a probable worst-case situation, actual impacts to the soil resources would probably be considerably less than what is shown below.

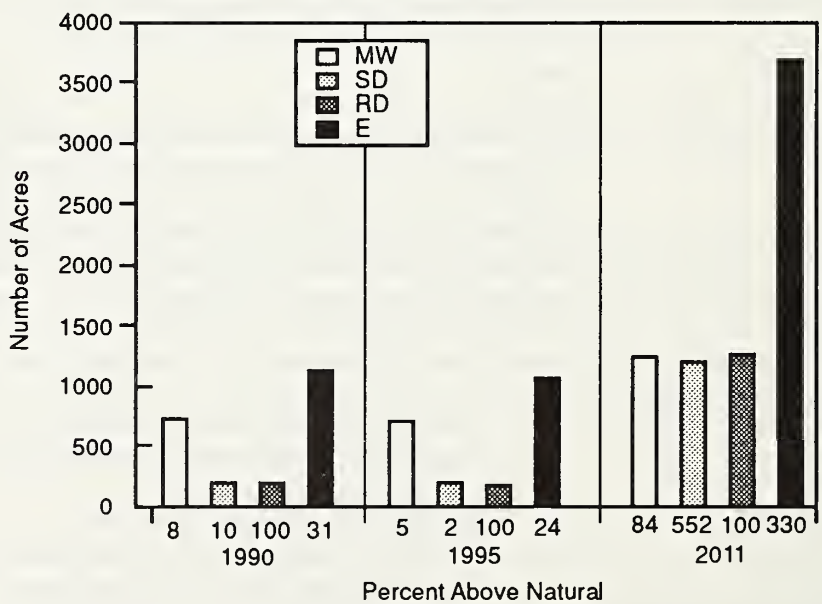
Figures 4-16 through 4-20 show the potential worst case cumulative effects for each of the action alternatives for years 1990, 1995, and 2011. Year 1990 represents the existing condition. Year 1995 represents the predicted situation if each alternative were implemented in 1995. Year 2011 represents the predicted situation if each alternative were implemented in 1995, and the Project Area were re-entered for timber harvest before year 2011.

For 1990 (existing conditions), VCU soil conditions are the same under all alternatives. For 1995 the effects by alternative are the same as discussed in the previous sections *Mass Wasting, Surface Erosion,* and *Loss of Site Productivity.*

A comparison of impacts of the alternatives shows that since Alternative 1 would defer activities for one major harvest, instead of two, it would have the greatest cumulative effect in 2011. This is due to stabilization and natural revegetation that occurs over time between harvests. The remaining action alternatives are similar ranging from a 236 to a 288 percent increase "at worst" over natural conditions by 2011.

Figure 4-16

Cumulative Soil Disturbance from Implementing Alternative 1 (in Acres)



SOURCE: West et al., 1991.
MW = Soil disturbance (acres) from mass wasting processes from roading, timber harvest, and natural (natural mass wasting assumed to be 674 acres).
SD= Surface soil erosion (acres) from activities other than roading (includes natural surface erosion) assumed to be 182 acres.
RD = Soil surface disturbance (acres) from road construction activities.
E = Summation of MW, SW, and RD.

Figure 4-17
Cumulative Soil Disturbance from Implementing Alternative 2 (in Acres)

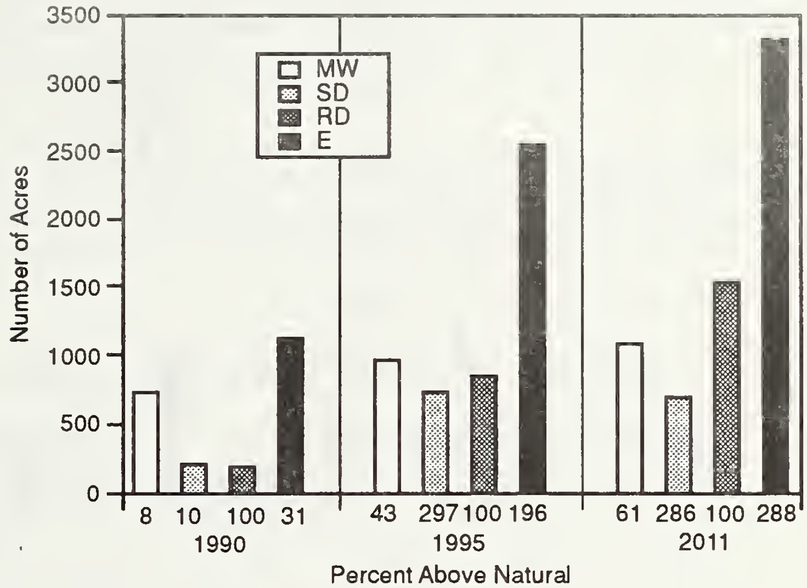


Figure 4-18
Cumulative Soil Disturbance from Implementing Alternative 3 (in Acres)

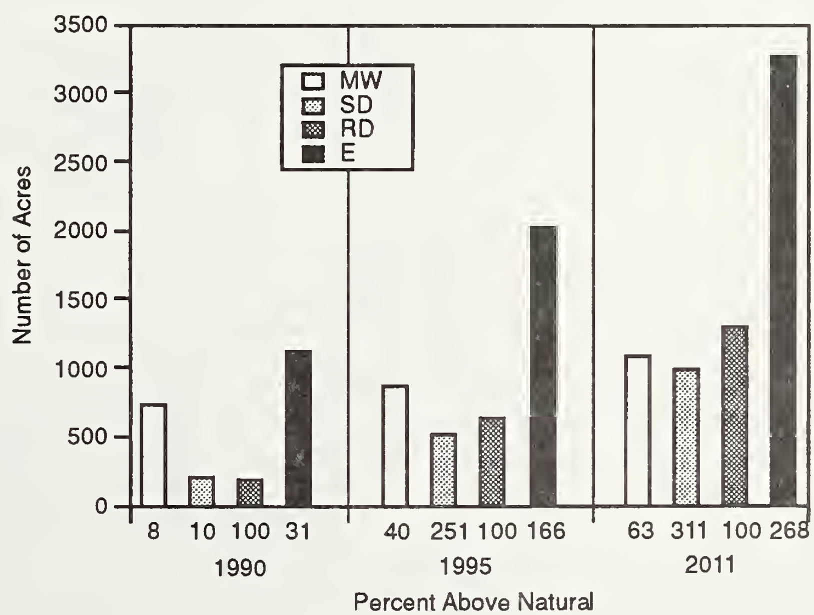


Figure 4-19
Cumulative Soil Disturbance from Implementing Alternative 4 (in Acres)

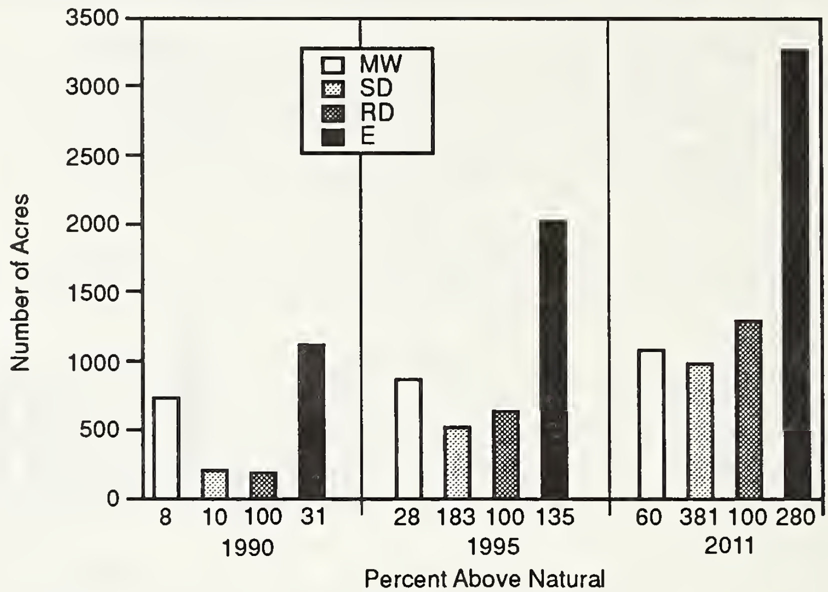
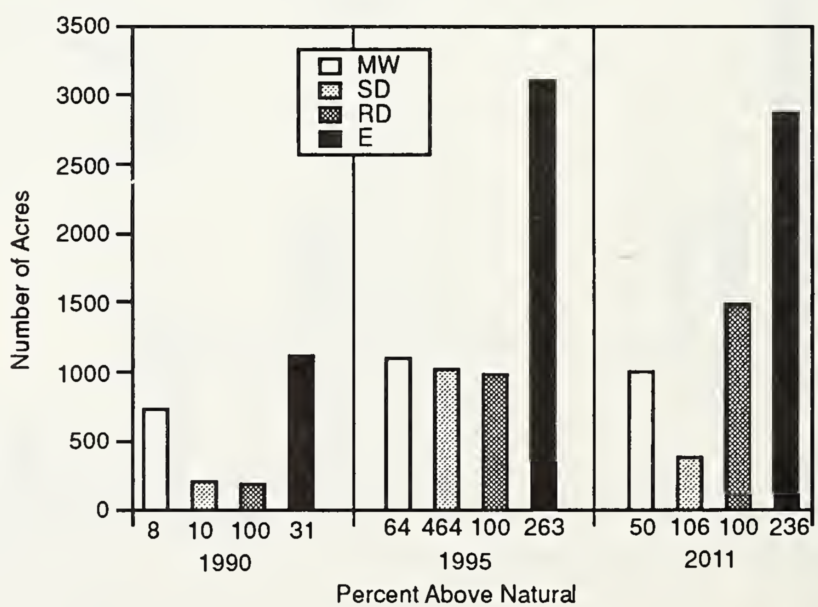


Figure 4-20
Cumulative Soil Disturbance from Implementing Alternative 5 (in Acres)



Watershed

Appleton Cove, Saook Bay, Hanus Bay-Portage Arm, Bourbon Creek, and portions of The Basin have experienced prior roading and timber harvesting. Re-entering these drainages would generate additional impacts. Legislation (Tongass Timber Reform Act) and management direction (BMPs) would largely limit most effects of sediment and increased flows from roads and harvest units. Those alternatives that harvest more in previously entered drainages are expected to have greater cumulative effects.

Table 4-43 displays the past harvest, proposed harvest this entry, and total harvest to the year 2011 by VCU. Effects are expected to be greater in those drainages with the highest percentages of harvest. The percentages in the last column exceed the past harvest plus the present entry harvest because the area would be entered again before the year 2011.

Table 4-43
Percentage of VCU Area Harvested by Alternative

VCU	Past Harvest	Proposed Harvest this Entry by Alternative Alt 2	Alt 3	Alt 4	Alt 5	Total Harvest to 2011[1]
293	10.3	15.5	19.7	15.4	21.8	30.0-33.3
294	2.8	6.9	10.7	6.6	11.4	13.5-14.9
296	7.9	13.4	8.5	9.0	12.0	21.9-25.5
297	4.8	10.2	10.7	8.5	14.1	21.3-25.4
298	3.1	4.5	1.9	2.8	5.4	8.6-9.6
314	0.3	0.5	0.3	0.4	1.8	2.4-3.2
315	1.6	13.0	6.7	10.4	16.4	19.9-21.8

SOURCE: Paustian and Starostka, 1991.

[1] The last column is a range because of various possible harvest scenarios to the year 2011.

The difference between the highest and lowest total acreage is 381 acres. This indicates that cumulative acreage harvested would be about the same for all the alternatives and impacts would generally be similar.

Comparison of Alternatives

Lacking detailed data to adequately model watershed responses to timber harvest, the percentage of watershed affected can be useful as a relative index of the potential for long-term effects of timber harvesting. Using this and other criteria, only a small number of drainage basins in the Kelp Bay Project Area are potentially susceptible to cumulative changes in streamflow regimens. These watersheds include Appleton Creek (VCU 293, P81A), North Portage Creek (VCU 296, Q35A), West Traders Creek (VCU 297, Q43A) and East Traders Creek (VCU 297, Q44A). Table 4-53 shows the watersheds sensitive to stream flow changes.

All of these watersheds have a relatively high proportion of commercial forest lands. These watersheds also have large concentrated blocks of clearcut harvest units from past entries. With the exception of Appleton Creek, watershed elevations are under 1,500 feet. Therefore, these streams are not significantly influenced by late season snowmelt runoff that would tend to mitigate changes in summer water demand caused by the removal of forest vegetation. In

addition, a proportion of these drainage basins are within the transient snow zone, making them most susceptible to rain on snow runoff effects. The percentage of proposed harvest in these watersheds was used as a relative index for evaluating potential streamflow changes, particularly lowflow effects. Projected cumulative watershed harvest percentages in Table 4-44 show little difference between any of the four action alternatives. Based on available research results, the effects of cumulative timber harvest on streamflow in these watersheds would be minor.

Table 4-44
Cumulative (%) Drainage Basin Harvest for Watersheds Sensitive to Stream Flow Changes

Watershed	VCU-wshed Number	Past Harvest %	Combined Harvest in 1995 Alt 2	Alt 3	Alt 4	Alt 5	Cumulative in 2011 %
Appleton Creek	293-P81A	14	16	23	17	23	25
North Portage	296-Q35A	11	21	11	11	11	21
West Traders	297-Q43A	11	15	19	23	19	33
East Traders	297-Q44A	12	19	23	15	23	34

SOURCE: Paustian and Starostka, 1991.

Trader Island drainages on Catherine Island. Cumulative effects of timber harvest would be minor.

Long-Term Productivity

Soils are considered to be permanently lost from the forest land base when their vegetation-producing character has been altered such that they are no longer capable of producing the same vegetation of the same composition. Soil loss from the forest land base also results from placement of overlay rock used for road construction and/or landings and from creating borrow pits. This loss may be temporary or permanent depending on the original vegetation. Forested or partially forested soils buried under a rock overlay road would generally be a temporary loss, provided the road (or landing) is not re-used in the future. On those sites where use does not re-occur, the soils would gradually go through an alder succession and ultimately produce forest vegetation again. Based upon observations, the length of time for this process depends on many factors but may range from 50 to 100 years. Wetter soils (i.e., muskeg soils) buried by rock overlay may never reproduce the same vegetation, but have potential to become productive again similar to the forested soils. The *Wetlands* section of this chapter discusses the environmental effects of road construction on wetlands.

Soil disturbances resulting from mass wasting and other surface disturbances often result in permanent loss or reduction of soil productivity. The amount of time required for rehabilitation depends on the severity of the disturbance and its exposure to continued aggravating forces. Borrow pits constitute a permanent loss of productivity since bedrock will not regenerate to vegetation for thousands of years. These losses occur on small portions of the landscapes and are minimized to the extent practicable, but are necessary for safe operations.

Recreation

Overview

Under all alternatives, the Kelp Bay Project Area has the potential to provide a wide range of recreation opportunities including a variety of recreation activities, settings, and experiences. The change in the recreation setting due to timber harvest and/or road construction activities may affect the recreation experience that a forest visitor has and, as a result, also affect the overall satisfaction of the visit. However, people seek recreation activities in specific areas for a variety of reasons and with a variety of expectations. Visitors seeking a primitive recreation experience will not be satisfied in an area with active timber management activities. On the other hand, visitors who do not require a natural setting for their recreation activities may appreciate the opportunity to use a newly constructed road for access into the area.

The result of this characteristic of the recreation resource is that it is difficult to project the environmental consequences of any proposed action. Although local residents of Southeast Alaska seem to value opportunities for remote, uncrowded wildland and marine outdoor recreation, visitors to this area from outside of Southeast Alaska may have expectations that are quite different. Fortunately, the specific opportunities, settings, and activities available vary greatly.

The principal method used for analyzing the environmental consequences in the Kelp Bay Project Area is based on this desire or expectation of forest visitors for specific types of experiences and settings. These expectations can be represented by the Recreation Opportunity Spectrum (ROS), a tool used by the Forest Service to measure and manage the types of experiences and settings for recreational activities. Each ROS class is defined in terms of activities, settings, and experiences offered in the area. The four ROS classes applicable to the Project Area are primitive, semi-primitive non-motorized, semi-primitive motorized, and road modified. The effects on the recreational resource can be assessed by analyzing the change in the acres of each ROS class that would result under the alternatives. A change in

ROS class resulting from the proposed actions in any alternative would reflect a change in the recreational setting, the recreational opportunities, and the recreational experiences offered in the area. See Chapter 3, *Recreation*, or the Glossary for more information on ROS.

Because recreation activities are largely confined to the accessible shorelines and the upland areas easily reached from these shorelines, a second method of assessing the environmental consequences of each alternative is to analyze the change in ROS class along the shoreline of the Project Area. Although there are approximately 157 miles of shoreline within the Project Area, some of these miles include off-shore islands and rocks. So, for the purpose of this analysis, only 144 miles of shoreline are included.

A third method to address the effects of the proposed actions is the change which might occur in the physical or social characteristics of specific Recreation Places (see Chapter 3, *Recreation*, or the Glossary for more information on Recreation Places). These Recreation Places are identified areas having one or more physical characteristic that is particularly attractive to people engaging in recreational activities. It is these specific inventoried places and the quality of their settings that constitute a large portion of the recreation opportunities in the Kelp Bay Project Area. Therefore, the degree of change in the condition of setting and the recreation opportunities available is an important measure of the effect of an alternative on the recreation resource.

Direct Effects

Many existing recreation activities are incompatible with an active logging operation because of noise, visual impacts, and the resulting change in the recreational setting. Recent analysis by the Forest Service has concluded that approximately 50 percent of the current activities occurring in Recreation Places rely upon the natural appearance of the area (Forest Service, 1990b). If a Recreation Place is entered for timber harvest, those activities that are incompatible cease until the area returns to a natural setting. It was estimated that the natural appearance of such an area would be expected to return after 40 years (Forest Service, 1990b). As a result, a Recreation Place entered for timber harvest would see a decline in at least some recreation activities for at least 40 years. The degree to which roading and harvesting have an impact on a Recreation Place determines whether its unique characteristics are lost or remain. Table 4-45 displays the effects of the alternatives on each of the identified Recreation Places.

Table 4-45
ROS Class by Alternative for Each Recreation Place (in acres)

Recreation Place ROS Class	Alternatives 1	2	3	4	5
Rodman Creek					
SPNM	346	261	261	261	261
RM	0	85	85	85	85
Subtotal	346	346	346	346	346
Appleton Cove					
RM	2462	6100	7168	5580	8421
Saook Bay, W Entrance					
SPM	37	37	37	37	37
Saook Bay, W Shore					
SPNM	98	0	0	0	0
SPM	0	98	98	98	0
RM	0	0	0	0	98
Saook Bay					
RM	935	4997	6888	5324	6972
Saook Bay Islands					
SPNM	25	0	0	0	0
SPM	0	25	0	25	0
RM	0	0	25	0	25
Pt. Kennedy to Pt. Moses					
SPM	558	298	120	298	120
RM	0	260	438	260	438
Subtotal	558	558	558	558	558
Lake Eva					
SPM	1373	1373	1373	1373	1373
Twin Lakes, L.L.Lake Eva					
SPNM	3090	1768	3090	3090	1239
SPM	244	27	244	244	27
RM	0	1539	0	0	2068
Subtotal	3334	3334	3334	3334	3334
Hanus Bay Islands					
SPM	51	51	51	51	51
Portage Arm - Catherine Is					
SPNM	563	0	0	0	563
RM	4439	14381	9948	10404	11032
Subtotal	5002	14381	9948	10404	11595
Catherine Is. SW Shore N					
SPNM	155	92	155	155	155
RM	0	63	0	0	0
Subtotal	155	155	155	155	155

Table 4-45 (continued)

ROS Class by Alternative for Each Recreation Place (in acres)

Recreation Place ROS Class	Alternatives 1	2	3	4	5
Catherine Is. SW Shore S					
SPNM	201	201	201	201	201
Catherine Is. E Shore					
WPM	932	455	932	932	886
RM	0	477	0	0	46
Subtotal	932	932	932	932	932
Echo Cove					
SPNM	445	47	445	445	445
SPM	0	164	0	0	0
RM	0	234	0	0	0
Subtotal	445	445	445	445	445
Middle Arm					
PRIM	1129	0	1129	0	0
SPNM	0	391	0	726	301
RM	0	738	0	403	828
Subtotal	1129	1129	1129	1129	1129
Bourbon Creek					
RM	1195	2567	1195	1800	2942
South Arm, N Entrance					
SPNM	48	48	48	48	0
RM	0	0	0	0	48
South Arm					
PRIM	10693	10619	10693	10693	5810
SPNM	0	174	0	0	4220
RM	0	0	0	0	1092
Subtotal	10693	10693	10693	10693	11122
Goat Lake					
PRIM	2996	2996	2996	2996	1654
SPNM	0	0	0	0	1342
Subtotal	2996	2996	2996	2996	2996
South Arm, S Entrance					
SPNM	17	0	17	17	0
RM	0	17	0	0	17
South Arm To The Basin					
RM	887	1715	887	1532	1715
The Basin					
SPNM	268	113	268	113	113
RM	524	1299	524	1299	1761
Subtotal	792	1412	792	1412	1874

Table 4-45 (continued)

ROS Class by Alternative for Each Recreation Place (in acres)

Recreation Place ROS Class	Alternatives 1	2	3	4	5
Pond Island					
SPNM	701	0	701	0	0
SPM	0	701	0	701	701
Cosmos Cove					
SPNM	649	0	649	649	0
SPM	331	401	331	331	401
RM	0	927	0	0	927
Subtotal	980	1328	980	980	1328

SOURCE: Chatham Area Geographic Information System.
Note: The ROS Classes include Primitive (PRIM), Semi-Primitive Non-Motorized (SPNM), Semi-Primitive Motorized (SPM), and Roaded Modified (RM).

Six Recreation Places are based on a road system. They are the Appleton Cove, Saook Bay, Portage Arm-Catherine Island, Bourbon Creek, South Arm to The Basin, and The Basin. The use of these areas is relatively low and the use that does occur is not dependent on a primitive or semi-primitive setting. These Recreation Places are not adversely affected by the proposed actions in Alternatives 2 through 5. On the other hand, those Recreation Places that change from a Primitive or Semi-Primitive ROS Class to a Road-Modified ROS Class are significantly affected. One example is Cosmos Cove, an undeveloped cove with a popular anchorage. Both Alternative 2 and 5 convert a majority of the area to Roaded Modified. This is a substantial effect on the Recreation Place. It may cause some existing use to be displaced to other undeveloped areas.

During timber harvest operations, the roads, sort yards, LTF sites, log raft storage, and camps are usually not suitable for general public use because of ongoing activity except at popular anchorages. Logging operations are historically active for 3 to 7 years. This is expected to be the case for the Kelp Bay Project as well. In addition, recreationists tend to avoid areas of active logging because the areas do not fulfill the users' expectations of a wildlands experience; also, the competition for natural resources from the logging camp's residents is high.

Areas undergoing active road construction and timber harvest would be classified as a Roaded Modified ROS Class. This modification in recreational setting would continue after operations cease, although encounters with other people would be more comparable with a Semi-Primitive ROS Class. The change in recreation setting would most likely cause a change in the recreational users that visit the area and the recreational activities that they participate in. Even if this did not occur, there would be a change in the recreational experience that person received. With the reconstruction and expansion of the road network for new timber sales, certain areas could be available or managed for motorized recreation use. But even roads that are closed by waterbarring could be used by ATV users for 5 to 7 years before the brush and alder would make the roads impassible. The increased access, especially if accompanied by motor vehicle or ATV use, would increase pressure on game species and sport fishing.

'Table 4-46 displays the changes in ROS Class for each alternative which occur as an immediate effect of timber harvest or road construction activities. Table 4-47 displays the changes in shoreline miles for each ROS Class by alternative. These two tables provide the best overall picture of the changes which will take place regarding the recreational resources for the Kelp Bay Project Area. All of these changes would remain until the natural appearance of the specific area returns (at least 40 years). There will be a moderate improvement in the recreation opportunities once active logging operations cease; however, the alteration of the physical and biological setting is a long-term effect.

Table 4-46

Changes in ROS Class by Alternative for the Kelp Bay Project Area (in acres)

	Alternatives				
ROS Class	1	2	3	4	5
PRIM	71,258	55,676	62,738	55,501	48,390
SPNM	66,567	55,175	57,445	62,624	59,335
SPM	5,641	7,323	6,159	8,461	7,030
RM	10,399	35,691	27,523	27,279	39,110
Total	153,865	153,865	153,865	153,865	153,865

SOURCE: Chatham Area Geographic Information System.
Note: The ROS Classes considered include Primitive (PRIM), Semi-Primitive Non-Motorized (SPNM), Semi-Primitive Motorized (SPM), and Roaded Modified (RM).

Table 4-47

Shoreline Miles for Each ROS Class by Alternative (in miles)

	Alternatives				
ROS Class	1	2	3	4	5
PRIM	12.73	6.11	12.73	7.65	0.00
SPNM	58.51	20.14	30.50	26.29	32.71
SPM	34.38	44.23	46.81	49.92	41.73
RM	38.59	73.73	54.17	60.35	69.77
Total	144.21	144.21	144.21	144.21	144.21

SOURCE: Chatham Area Geographic Information System.
Note: Although there are approximately 157 miles of shoreline within the Project Area, some of these miles include off-shore islands and rocks. For the purpose of this analysis, only 144 miles of shoreline are included.

The overall consequence to the Kelp Bay Project Area, as far as recreation opportunities (ROS) are concerned, is a general loss of Primitive and Semi-Primitive Non-Motorized recreation opportunities; more roaded opportunities would be made available under all action alternatives. These changes in ROS are both substantial and significant for the Kelp Bay Project Area. However, the Kelp Bay Project Area contains only a small amount of the total recreation opportunities on the Tongass National Forest, and there are other similar recreation opportunities nearby. These changes in ROS are substantial but the Kelp Bay Project Area contains only a small amount of the total recreation opportunities on the Tongass National Forest and there are other similar recreation opportunities nearby. The overall shift in recreational opportunities from Primitive and Semi-Primitive Non-Motorized to Semi-Primitive Motorized and Roaded Modified is a minor impact under each alternative. The changes in shoreline miles for each ROS class would have a minor impact for Alternative 3 and a moderate impact for Alternatives 2, 4, and 5.

Visual quality is important to the recreation visitor and to the tourist visiting or viewing the area, especially if the user is looking for a wildlands experience. Disturbances to the land, such as clearcuts and roads, create a visual condition that may detract from the experiences many users are attempting to achieve. This is more fully discussed in the *Visual* section later in this chapter. Table 4-48 displays acres of roaded and harvested land of VCU for each alternative. For the purpose of this analysis, these developments (roads and clearcuts) are buffered by 660 feet (1/8 mile) on all sides. This buffering is required to reflect a minimal screening distance for people recreating in areas adjacent to the developments.

Table 4-48

Acres of Roaded and Harvested Land (in acres)

	Alternatives				
VCU	1	2	3	4	5
293	3,316	5,822	6,907	5,786	7,447
294	1,630	5,061	6,951	5,325	7,411
295[1]	0	32	0	0	47
296	2,675	5,773	3,342	3,888	4,508
297	2,435	7,223	5,831	5,266	7,996
298	1,517	3,843	1,760	2,821	4,334
314	227	380	227	256	1,744
315	1,424	3,419	1,424	2,454	3,871
Total	13,224	31,553	26,442	25,796	37,358

SOURCE: Chatham Area Geographic Information System.

1 For the purpose of this analysis, these developments (roads and clearcuts) are buffered by 660 feet (1/8 mile) on all sides. As a result of two harvest units lying near the boundary of VCU 295, Alternatives 2 and 5 show acres of roaded and harvested land. These acres are only acres of buffer, not of actual harvested land.

All action alternatives increase the area of development. Such development is consistent with TLMP land use designations.

Table 4-48 displays a comparison, in acres, of developed land by alternative. Because the level of development is an important aspect of recreation opportunities, this comparison gives an important measure of change in the recreation opportunities of the Kelp Bay Project Area. Although an increase in acres of developed land from about 13,000 to about 37,000 would have a significant negative effect on people seeking an undeveloped setting for their recreational activities, people who do not require an undeveloped setting will not be effected. This increase may result in existing recreation users being displaced from the Project Area if they are seeking undeveloped areas. This increase may also result in new recreation users being attracted to the area because of the increased road access for ATVs, mountain bicycles, or even foot travel.

Alternatives 3 and 4 approximately double the acreage of developed land, while Alternative 5 almost triples this development. Alternative 2's development falls in between these extremes. All action alternatives significantly increase the acreage of development within the Project Area; however, there are substantial acreages of undeveloped land available outside of the Project Area. Proposed development is consistent with LUD III and LUD IV designations in the TLMP.

Effects by VCU

Tables 4-49 through 4-64 display for each VCU the same information that was presented in Tables 4-46 and 4-47 for the entire Project Area. These tables provide the reviewer with the opportunity to examine the specific changes projected for each VCU.

Table 4-49
ROS Class by Alternative for VCU 293 (in acres)

	Alternatives				
ROS Class	1	2	3	4	5
PRIM	11	0	0	0	0
SPNM	10,783	7,100	5,785	6859	5,398
SPM	523	452	452	452	563
RM	2,421	6,186	7,501	6427	7,777
Total	13,738	13,738	13,738	13738	13,738

SOURCE: Chatham Area Geographic Information System.
Note: The ROS Classes include Primitive (PRIM), Semi-Primitive Non-Motorized (SPNM), Semi-Primitive Motorized (SPM), and Roaded Modified (RM).

Table 4-50
Shoreline Miles for Each ROS class by Alternative for VCU 293 (in miles)

ROS Class	Alternatives 1	2	3	4	5
PRIM	0.00	0.00	0.00	0.00	0.00
SPNM	4.02	0.00	0.00	0.00	0.00
SPM	4.32	3.53	3.53	3.53	3.53
RM	5.82	10.63	10.63	10.63	10.63
Total	14.16	14.16	14.16	14.16	14.16

SOURCE: Chatham Area Geographic Information System.

Table 4-51
ROS Class by Alternative for VCU 294 (in acres)

ROS Class	Alternatives 1	2	3	4	5
PRIM	9,354	890	890	890	890
SPNM	12,821	15,603	14,266	15,277	14,112
SPM	724	2,089	994	2,089	599
RM	941	5,258	7,690	5,584	8,240
Total	23,840	23,840	23,840	23,840	23,841

SOURCE: Chatham Area Geographic Information System.
Note: The ROS Classes include Primitive (PRIM), Semi-Primitive Non-Motorized (SPNM), Semi-Primitive Motorized (SPM), and Roaded Modified (RM).Table 4-70

Table 4-52
Shoreline Miles for Each ROS Class by Alternative for VCU 294 (in miles)

ROS Class	Alternatives 1	2	3	4	5
PRIM	0.00	0.00	0.00	0.00	0.00
SPNM	5.48	0.00	0.00	0.00	0.00
SPM	5.21	7.72	4.61	7.72	3.54
RM	4.30	7.27	10.38	7.27	11.45
Total	14.99	14.99	14.99	14.99	14.99

SOURCE: Chatham Area Geographic Information System.

Table 4-53
ROS Class by Alternative for VCU 295 (in acres)

ROS Class	Alternatives 1	2	3	4	5
PRIM	8,286	8,286	8,286	8,286	8,286
SPNM	2,590	2,590	2,590	2,590	2,590
SPM	1,374	1,374	1,374	1,374	1,374
RM	0	0	0	0	0
Total	12,250	12,250	12,250	12,250	12,250

SOURCE: Chatham Area Geographic Information System.
Note: The ROS Classes include Primitive (PRIM), Semi-Primitive Non-Motorized (SPNM), Semi-Primitive Motorized (SPM), and Roaded Modified (RM).

Table 4-54
Shoreline Miles for Each ROS Class by Alternative for VCU 295 (in miles)

ROS Class	Alternatives 1	2	3	4	5
PRIM	0.00	0.00	0.00	0.00	0.00
SPNM	0.00	0.00	0.00	0.00	0.00
SPM	3.90	3.90	3.90	3.90	3.90
RM	0.00	0.00	0.00	0.00	0.00
Total	3.90	3.90	3.90	3.90	3.90

SOURCE: Chatham Area Geographic Information System.

The direct effects in VCU 295 will be the same for all alternatives because no timber harvests are planned. The decision to not harvest in this VCU was made in the TLMP in 1979 when this VCU was designated a LUD II. A LUD II designation allows for roading but not timber harvest.

Table 4-55
ROS Class by Alternative for VCU 296 (in acres)

ROS Class	Alternatives 1	2	3	4	5
PRIM	286	0	286	0	0
SPNM	13,381	8,906	11,711	11,631	11,290
SPM	343	330	343	343	126
RM	2,068	6,842	3,738	4,104	4,662
Total	16,078	16,078	16,078	16,078	16,078

SOURCE: Chatham Area Geographic Information System.
Note: The ROS Classes include Primitive (PRIM), Semi-Primitive Non-Motorized (SPNM), Semi-Primitive Motorized (SPM), and Roaded Modified (RM).

Table 4-56
Shoreline Miles for Each ROS Class by Alternative for VCU 296 (in miles)

ROS Class	Alternatives 1	2	3	4	5
PRIM	0.00	0.00	0.00	0.00	0.00
SPNM	15.49	7.17	11.96	10.97	15.49
SPM	4.63	5.41	4.63	4.63	3.28
RM	9.03	16.57	12.56	13.55	10.38
Total	29.15	29.15	29.15	29.15	29.15

SOURCE: Chatham Area Geographic Information System.

Table 4-57
ROS Class by Alternative for VCU 297 (in acres)

ROS Class	Alternatives 1	2	3	4	5
PRIM	0	0	0	0	0
SPNM	11,870	4,870	7,926	7,838	4,567
SPM	1,549	1,751	1,868	2,297	3,144
RM	2,365	9,163	5,990	5,649	8,073
Total	15,784	15,784	15,784	15,784	15,784

SOURCE: Chatham Area Geographic Information System.
Note: The ROS Classes include Primitive (PRIM), Semi-Primitive Non-Motorized (SPNM), Semi-Primitive Motorized (SPM), and Roaded Modified (RM).

Table 4-58
Shoreline Miles for Each ROS Class by Alternative for VCU 297 (in miles)

	Alternatives				
ROS Class	1	2	3	4	5
PRIM	0.00	0.00	0.00	0.00	0.00
SPNM	0.00	0.00	0.00	0.00	0.00
SPM	13.22	8.91	13.22	13.22	12.97
RM	7.78	12.09	7.78	7.78	8.03
Total	21.00	21.00	21.00	21.00	21.00

SOURCE: Chatham Area Geographic Information System.

Table 4-59
ROS Class by Alternative for VCU 298 (in acres)

	Alternatives				
ROS Class	1	2	3	4	5
PRIM	18,914	12,998	18,869	12,999	12,999
SPNM	8,315	11,262	8,360	12,791	10,773
SPM	0	0	0	0	0
RM	1,195	4,164	1,195	2,634	4,652
Total	28,424	28,424	28,424	28,424	28,424

SOURCE: Chatham Area Geographic Information System.
Note: The ROS Classes include Primitive (PRIM), Semi-Primitive Non-Motorized (SPNM), Semi-Primitive Motorized (SPM), and Roaded Modified (RM).

Table 4-60
Shoreline Miles for Each ROS Class by Alternative for VCU 298 (in miles)

	Alternatives				
ROS Class	1	2	3	4	5
PRIM	5.08	0.00	5.08	0.00	0.00
SPNM	8.45	5.32	8.03	7.37	6.40
SPM	0.00	0.00	0.00	0.00	0.00
RM	1.73	9.94	2.15	7.89	8.86
Total	15.26	15.26	15.26	15.26	15.26

SOURCE: Chatham Area Geographic Information System.

Table 4-61
ROS Class by Alternative for VCU 314 (in acres)

	Alternatives				
ROS Class	1	2	3	4	5
PRIM	33,326	33,502	33,326	33,326	26,215
SPNM	1,765	1,472	1,765	1,765	7,461
SPM	0	0	0	0	0
RM	200	317	200	200	1,615
Total	35,291	35,291	35,291	35,291	35,291

SOURCE: Chatham Area Geographic Information System.
Note: The ROS Classes include Primitive (PRIM), Semi-Primitive Non-Motorized (SPNM), Semi-Primitive Motorized (SPM), and Roaded Modified (RM).

Table 4-62
Shoreline Miles for Each ROS Class by Alternative for VCU 314 (in miles)

ROS Class	Alternatives 1	2	3	4	5
PRIM	7.65	6.11	7.65	7.65	0.00
SPNM	4.98	5.40	4.98	4.98	9.36
SPM	0.00	0.00	0.00	0.00	0.00
RM	0.99	2.11	0.99	0.99	4.26
Total	13.62	13.62	13.62	13.62	13.62

SOURCE: Chatham Area Geographic Information System.

Table 4-63
ROS Class by Alternative for VCU 315 (in acres)

ROS Class	Alternatives 1	2	3	4	5
PRIM	1,081	0	1,081	0	0
SPNM	5,042	3,372	5,042	3,873	3,144
SPM	1,128	1,327	1,128	1,906	1,224
RM	1,209	3,761	1,209	2,681	4,091
Total	8,460	8,460	8,460	8,460	8,460

SOURCE: Chatham Area Geographic Information System.
Note: The ROS Classes include Primitive (PRIM), Semi-Primitive Non-Motorized (SPNM), Semi-Primitive Motorized (SPM), and Roaded Modified (RM).

Table 4-64
Shoreline Miles for Each ROS Class by Alternative for VCU 315 (in miles)

ROS Class	Alternatives 1	2	3	4	5
PRIM	0.00	0.00	0.00	0.00	0.00
SPNM	20.09	2.25	5.53	2.97	1.46
SPM	3.10	14.76	16.92	16.92	14.51
RM	8.94	15.12	9.68	12.24	16.16
Total	32.13	32.13	32.13	32.13	32.13

SOURCE: Chatham Area Geographic Information System.

A review of Tables 4-49 and 4-64 shows that VCUs 315 and 298 have the greatest potential for change in shoreline miles for SPM and RM ROS, and that this change would occur in Alternatives 2 and 5. It also shows that VCUs 293 and 297 have the greatest potential for change in SPM and RM ROS acres, and that this change would occur in Alternatives 2 and 5 for VCU 297, and Alternatives 3 and 5 for VCU 293. These changes will only have an effect on those individuals seeking non-motorized recreation experiences.

Wild and Scenic Rivers

Only in Alternative 5 would there be consequences to a river that is being considered for inclusion in the Wild and Scenic Rivers System--the Glacial River located in the South Arm of Kelp Bay. The proposed timber harvest may affect this area visually and, during the logging operation, noise may be a factor. The most noticeable impact would be from the blasting of a cliff directly across from the mouth of river. The distance between the two features is half of a mile. If the area is developed to accommodate an LTF even after the structure is pulled, the area can never be restored to its natural state.

Indirect Effects

An indirect effect of the proposed activities in the action alternatives would be increased recreational and subsistence use in the vicinity of the logging camps and logging activities. This increased use would be predominately hunting, fishing, and gathering of forest products.

Another indirect effect of Alternatives 2 through 5 would be the noise from the logging operations. The concern is greatest for the Lake Eva Recreation Cabin (in VCU 295), one of the most heavily used cabins in the Chatham Area system. Solitude is a main attraction to this cabin. Lake Eva is protected by ridge systems on both sides that would effectively block most of the noise. The closest logging units to the east is three-quarters of a mile away and is only proposed in Alternatives 2 and 5. To the west in all the action alternatives, the units are a mile away. The noise problem would only last during the actual logging operations near

this VCU. Because the units are in different VCUs and could be harvested at different times, noise could be a problem in the area for a total of 5 to 7 years. This may affect the solitude and experiences of people visiting the Lake Eva area and the recreation cabin.

Throughout the Project Area, people will use the road systems for recreation purposes after harvesting has been completed. These recreationists would place increased pressure on the fish and wildlife resources. This use may diminish over time as the alder slowly closes the road to foot traffic.

Recreational Special Use

There has been only one Recreation Special Use Permit issued for the Kelp Bay Project Area in recent years. It has been issued to an outfitter and guide for a camp on Pond Island in Kelp Bay. The guide advertises fishing, wildland experiences, and nature photography. Additional operations are expected to be placed under permit in the next couple of years. These operations use most of the bays in the Project Area, and are primarily for outfitters and guides offering sightseeing and big game hunting (brown bear) experiences.

If logging activities take place in the vicinity of Pond Island, the permittee may determine that the area has been developed to an extent that the wildland experiences once offered have now been altered. This same effect may result for the other special use operations expected to be placed under permit in other parts of the Project Area. The alteration of the landscape will affect the experiences of their clients, whether they are hunting, fishing, or otherwise utilizing the national forest.

Cumulative Effects

The changes to the landscape as a result of timber harvests and road construction would change the ROS Class for the affected areas from a Primitive or Semi-Primitive Non-Motorized ROS opportunity to a Roaded Modified ROS. As harvesting continues over the life of the APC contract, the Primitive and Semi-Primitive Non-Motorized opportunities will be significantly reduced or eliminated within the Project Area. In addition, if the decision is made to manage more roads for motorized recreation use, the recreation opportunities would shift to those offered in a motorized setting.

Timber harvest and road construction along or near the beaches would have a significant effect on the recreationists in this area. Access for most people to this area is by boat, the most economical and flexible mode of traveling for this area. If the anchorages and beaches are protected through buffering or other actions, people would most likely continue to use these areas. However, there would be a change in the recreational experiences provided due to the disturbance in the surrounding areas.

With the logging of the Project Area, there would be a general displacement of recreational users who are seeking a wildlands experience. There would also be a displacement of outfitters and guides who provide a wildlands experience for clients. The overall effects of this displacement are unknown at this time. On the other hand, the continual development would open up the Project Area to recreational activities that are not dependent on a natural setting. This would particularly be true as the small isolated road networks are gradually connected over time.

Visual Quality

Direct and Indirect Effects

Overview

A key attraction of Southeast Alaska for the recreationist, occasional visitor, and those who live there is its beauty and splendor. The visual resources value is important to the enjoyment of the area as well as to its economy because of the impact of tourism.

Alternatives 2 through 5 would result in visual impacts of varying degrees in the Kelp Bay Project Area. These impacts would come primarily from clearcut harvest methods, road construction, and the construction of LTFs. These activities create unnatural lines and textures in the landscape which contrast with the rough, even-texture characteristic of Southeast Alaska old-growth rainforest. These visual impacts, in many cases, will be evident to the average national forest visitor.

To assist in the evaluation of the visual impacts of the various alternatives, computer-generated perspective views were created. Figure 4-21 displays a computer-generated simulation of an example landscape. These computer simulations, along with field observations and topographic map analysis, were used to determine the VQOs that would result from the proposed actions, as well as the Expected Visual Condition. This evaluation assumes that the design criteria for the visual resource, described in Appendix C, will be considered during unit layout.

Figure 4-22 displays a computer-generated simulation of a generic landscape managed under the four Visual Quality Objectives (VQOs) applicable to this project. This figure is provided to better enable the reader to understand the Visual Management System and to visualize the differences between the four VQOs. The four VQOs are listed below, along with a brief description of the characteristics of each. A complete description of each VQO is provided in the Glossary.

- Retention - Management activities not visually evident.

- Partial Retention - Management activities remain visually subordinate to natural landscape.

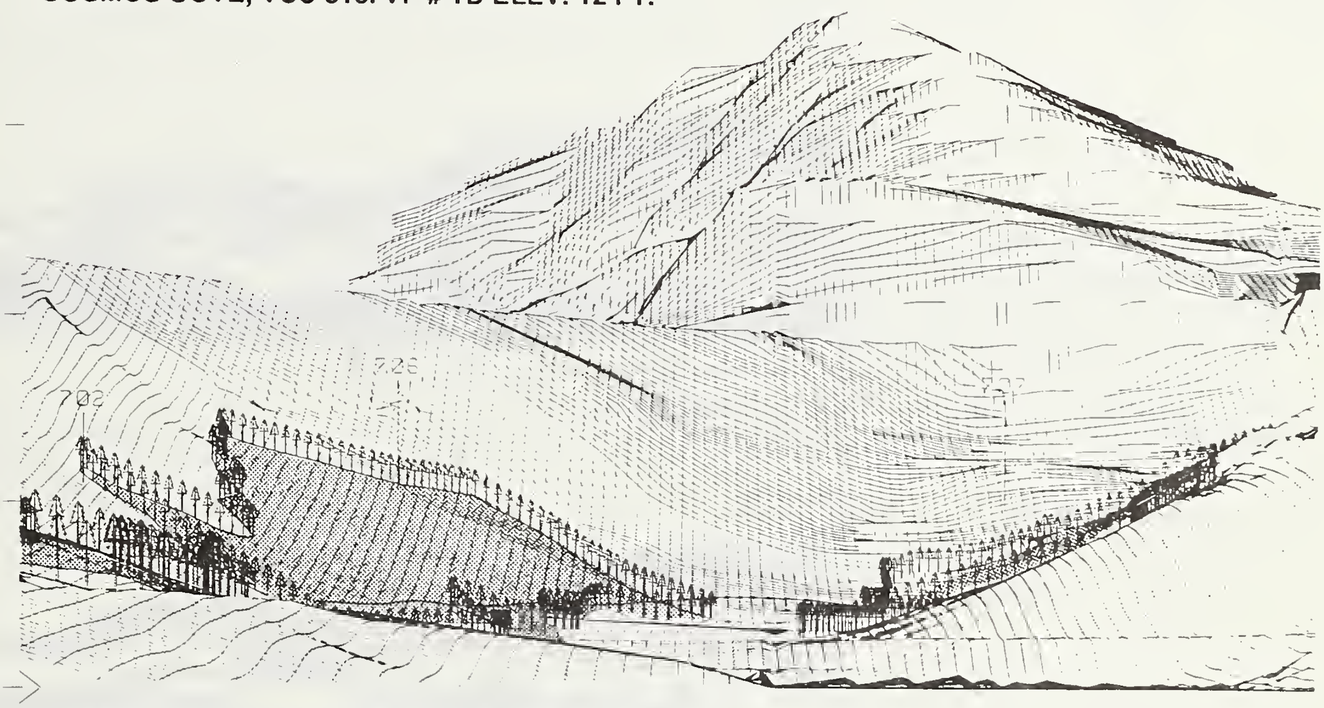
- Modification - Management activities may dominate the natural landscape, but resemble natural occurrences.

- Maximum Modification - Management activities may dominate the landscape.

Table 4-65 displays the VQOs resulting for each alternative's activities. For Alternative 1, only the inventoried VQOs are shown and for Alternatives 2 through 5 the VQO resulting from implementation of the proposed actions are displayed. The increases in modification and maximum modification VQOs would have minor impacts under Alternatives 2, 3, and 4 and a moderate impact with Alternative 5.

Figure 4-21
Computer-generated Simulation of an Example Landscape

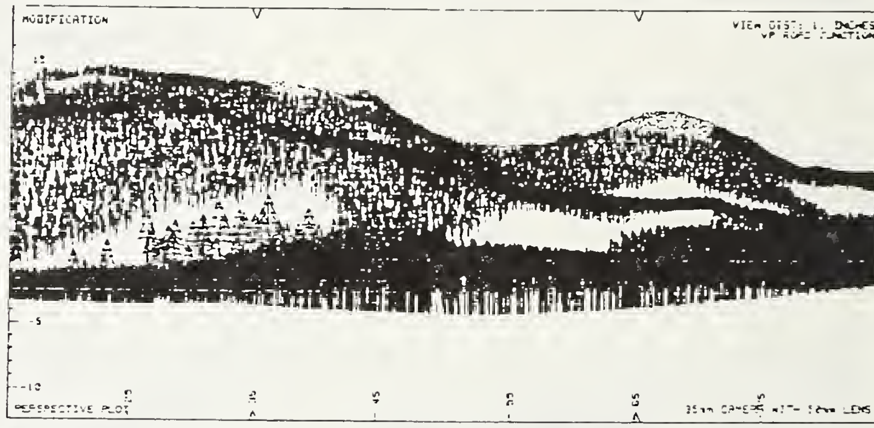
COSMOS COVE, VCU 315. VP # 1B ELEV. 12 FT.



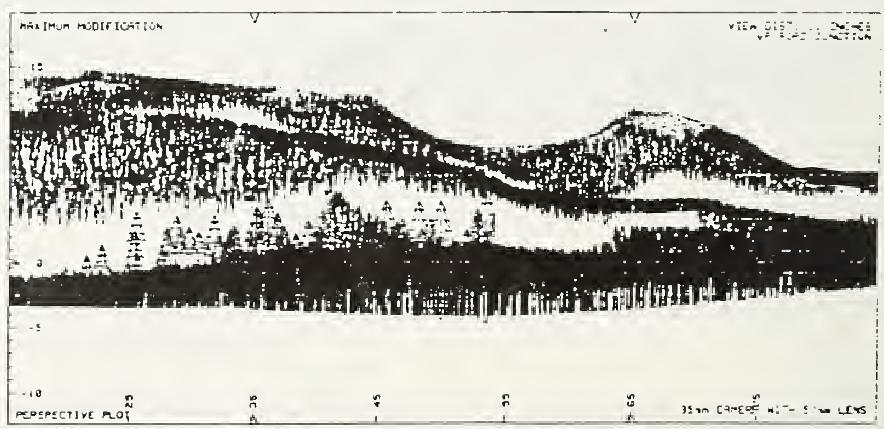
VIEW FROM ENTRANCE OF COVE

Figure 4-22
GIS Simulation of Example Landscape Managed under Project VQOs

Retention



Modification



Maximum Modification

Partial Retention

Table 4-65
Visual Quality Objectives (in acres)

Visual Quality Objectives	Alternatives 1	2	3	4	5
Retention	4,200	3,617	4,200	4,200	3,567
Partial Retention	71,337	54,307	57,356	57,064	46,533
Modification	71,071	69,427	76,448	83,965	85,136
Maximum Modification	7,255	26,512	15,859	8,634	18,627

SOURCE: Wetherell et al., 1991.

Table 4-66 displays the acreage in each existing Visual Condition that would be affected by each alternative. Alternative 1 displays the inventoried Existing Visual Condition (EVC) of the Project Area. Alternatives 2 through 5 display the Expected Visual Condition from the implementation of the proposed actions. Visual Conditions are ranked I through VI, with Visual Condition Type I appearing natural to the visitor, and Visual Condition Type VI exhibiting changes in glaring contrast to the natural environment. See the Glossary for complete descriptions of each Visual Condition type.

Table 4-66
Existing/Expected Visual Condition (in acres)

Visual Condition Types	Alternatives 1	2	3	4	5
I	126,079	88,350	99,314	95,424	80,214
II	90	90	90	90	90
III	0	0	0	0	0
IV	0	3,974	1,947	882	4,971
V	27,694	53,644	47,946	55,911	47,627
VI	0	7,805	4,566	1,556	20,961

SOURCE: Wetherell et al., 1991.

This discussion displays the environmental consequences of timber harvesting and road construction on the visual resource by alternative. See the following section for the discussion of the effects of LTFs and logging camps.

Comparison of Alternatives

This discussion displays the environmental consequences of timber harvests and road construction on the visual resource by alternative. See the following section for the discussion of the effects of LTFs and logging camps.

Alternative 1
In this alternative, the inventoried VQOs and the Existing Visual Condition would remain unchanged.

Alternative 2
Under Alternative 2, timber harvest and road building would be more widely distributed than under other alternatives; thus, they would have a moderate impact on the visual resource in the Project Area as a whole. Cosmos Cove, however, would receive substantial visual impacts.

Timber harvest and road building would take place in seven VCUs in this alternative. Two VCUs (298 and 314) would meet the inventoried VQOs while parts of VCUs 293, 294, 296, 297, and 315 would not.

- VCU 298, VCU 314 - Existing harvest activity in VCUs 298 and 314 is evident; the additional visual impact associated with this alternative, in the form of line, color, and texture changes, would be consistent with the inventoried VQOs for that area.

- VCU 293, VCU 294 - In VCUs 293 and 294, the south shore of Peril Strait between Appleton Cove and Hanus Bay is visible to small boat, ferry, and cruiseship traffic in Peril Strait. A portion of the area is visible from the anchorage in Appleton Cove. Because of the concentration of harvest along these slopes, the area will not meet the VQO of Partial Retention; instead, a VQO of Modification will be achieved (Units 138, 139, 140, 141, 144, 153, 150, 151, 157, 128, 129, 134, 158, 132, 131, 206, 247, 201, 202, 200, and 203).

- VCU 296 - In VCU 296, Harvest Units 307 and 301, which lie in the Twin Lakes drainage, will not meet the VQOs of retention and partial retention. This is due to their placement along the highly visible middle ground slopes along Peril Strait and Twin Lake itself. Harvest on these slopes would therefore meet a modification VQO. Hanus Bay, which has been heavily harvested in the past, would retain the current VQO of Modification.

- VCU 297 - There are several portions of VCU 297 that do not meet the inventoried VQOs. Units 427 and 429, located immediately adjacent to past harvest units on the north end of Catherine Island, would not meet the inventoried VQO of Partial Retention. These slopes are the dominant view of cruise ships, ferries, and small boats as they make the turn on the southbound run from Chatham to Peril Strait. Visual alterations in this area would be more consistent with a Modification to Maximum Modification VQO. Units 440, 441, 443, and 445 (located on the east coast of Catherine Island) would not meet the inventoried VQO of Partial Retention, but instead would be more consistent with a Modification VQO.

- VCU 315 - Cosmos Cove would receive a major visual alteration under this alternative. Timber harvest (Units 700, 701, 702, 703, 706, and 707) in this high-use anchorage would meet a VQO of Maximum Modification when viewed from within the cove. Some of the clearcuts and roads would also be visible to traffic along the marine travel route in Chatham Strait.

Alternative 3

Alternative 3 would maintain the visual resources in greater Kelp Bay in the condition that currently exists. However, there would be a major impact on the visual resources in Peril Strait from Appleton Cove to Catherine Island, and in Chatham Strait along the east shore of Catherine Island. Cosmos Cove would also receive major visual impacts. The southern quarter of Portage Arm would remain unchanged with no additional impacts to the visual resource.

Blow-down strip between two harvest units on Catherine Island. Such impacts on the visual character of the Kelp Bay Project Area are an important consideration.

Under this alternative, timber harvest would take place in parts of five VCUs in the study area. Three VCUs (296, 297, and 298) would meet the inventoried VQOs, while VCUs 293 and 294 would not.

- VCU 296, VCU 297 - Existing harvest activity in VCUs 296 and 297 is evident and the additional visual impact associated with this alternative, in the form of line, color, and texture changes, would be consistent with the inventoried VQOs for that area.

- VCU 298, VCU 296 - VCU 298 contains only a minimal amount of proposed harvest activity located on the ridge top above Portage Point and results from overlap of units actually located in VCU 296. This activity would meet the inventoried VQO of Modification.

- VCU 293 - The timber harvest and road construction in VCU 293 on the slopes above Point Benham and Saook Point would not meet the inventoried VQOs of Partial Retention due to the size, spacing, and intensity of the harvest units. This area would meet a VQO of Modification.

- VCU 294 - Portions of VCU 294 would also not meet the inventoried VQOs. Intensive timber harvest and road construction along the southeast shore of Saook Bay and the slopes above the stretch of shoreline between Saook Bay and Hanus Bay would result in a VQO of Modification to Maximum Modification. This timber harvest is situated on the higher elevation slopes that are visible from the inventoried cruise ship, ferry, and small boat route in Peril Strait, in addition to the anchorage in Saook Bay.

Alternative 4

Alternative 4 would create a moderate impact on the visual resource in the Project Area. The slopes northeast of Appleton Cove, northeast of Saook Cove, and the northeast end of Catherine Island would all receive strong visual impacts resulting from concentrated harvest. Harvest activity under this alternative would take place in six VCUs. Activities in two VCUs (298 and 314) would meet inventoried VQOs, while activities in VCUs 293, 294, 296, and 297 would not under current design.

- VCU 298, VCU 314 - Past timber harvest activity in·VCUs 298 and 314 is evident; the additional impact associated with this alternative, in the form of line, color, and texture changes, would be consistent with the inventoried VQOs for that area.

- VCU 293 - For this alternative, effects in VCU 293 are identical to those described under Alternative 3.

- VCU 294 - In VCU 294, units 206, 247, 202, 201, and 200 (which are located on the southeast shore of Peril Strait between Saook Bay and Hanus Bay) do not meet the inventoried VQOs. Several of these units are close together and lie on prominent knobs that are highly visible from the ferry route in Peril Strait. These units would meet a VQO of Modification due to their concentration and orientation on the slope.

- VCU 296 - The group of units situated at the north end of Portage Arm in VCU 296 would not meet the inventoried VQO of Partial Retention due to previous harvest activity and their placement on prominent, high-elevation steep slopes (Units 320, 329, 305, 353, 330, and 334). The clearcuts proposed in this alternative for these slopes do not harmonize with the surrounding terrain and do not relate to lines or forms found in the area. The visual impacts created by the proposed activity would meet a VQO of Maximum Modification.

  The units located on the slopes above Thatcher Channel on the northeast side of Catherine Island would not meet the inventoried VQO of Partial Retention (Units 427 and 429). These clearcuts would have a visual impact that would be more consistent with a Modification VQO due to their exposure to middle-ground views from the marine travel route and the immediately adjacent, previously clearcut areas.

- VCU 315 - Harvest activity is already apparent in VCU 315; the proposed activity under this alternative should meet the inventoried VQOs for this area, with the exception of the clearcuts located west of South Point behind Pond Island (Units 710, 711, 732, 714). These units impact the foreground views from a high-use anchorage at that location. The impacts created by this alternative would be meet a VQO of Maximum Modification.

Alternative 5
Under Alternative 5, the large-scale land disturbance associated with full-commodity development would have a major affect on the viewable landscape of the Project Area. With this level of development, there is less spatial distribution of the clearcuts; consequently, many areas would have a VQO of Maximum Modification or would exceed the maximum modification VQO.

Timber harvest would take place in seven VCUs under this alternative. Six of the seven VCUs would contain some activity that will not meet inventoried VQOs. The VCUs that would be affected under this alternative are 293, 294, 296, 297, 314, and 315.

- VCU 298 - In some parts of VCU 298, noticeable visual impacts would be created by harvest activity; however, these impacts fall within the parameters of the specified VQO.

- VCU 293 - Visually apparent activities in VCU 293 would occur on the slopes above Point Benham and Saook Point. These activities would not meet the inventoried VQOs of Partial Retention due to the size, spacing, and intensity of the harvest units, but would meet a VQO of Modification to Maximum Modification when viewed from the anchorage north of Anderson Island in Appleton Cove.

- VCU 294 - Under this alternative, effects in VCU 294 would be the same as those described under Alternative 3.

- VCU 296 - The area surrounding the Hanus Bay anchorage would meet a VQO of Maximum Modification.

- VCU 297 - There are several portions of VCU 297 that would not meet the inventoried VQOs. Due to existing harvest units located immediately adjacent to proposed harvest units, the north end of Catherine Island would not meet the inventoried VQO of Partial Retention. These slopes are the dominant view of cruise ships, ferries, and small boats as they make the turn on the southbound run from Chatham to Peril Strait. Visual alterations in this area would meet a VQO of Modification to Maximum Modification. Other units located on the east coast of Catherine Island would not meet the inventoried VQO of Partial Retention and would directly affect views from the marine travel route in Chatham Strait. Visual alterations in this area would meet a VQO of Modification.

- VCU 314 - Several units in the Clear River valley in VCU 314 would not meet the inventoried VQO of Partial Retention. Units 622, 631, 630, 624, and 619 are on the slopes of the Clear River valley and might be seen from a proposed recreational trail along the Clear River, depending upon the exact location of the trail which has not yet been determined. Unit 619, which is located on the slope above the head of Middle Arm, would create a moderate impact on the small boat route in Middle Arm.

- VCU 315 - Harvest activity inside VCU 315 would adversely affect the visual resource in The Basin and Cosmos Cove. Two units in the southwest corner of The Basin would be seen from the anchorage south of Pond Island as well as the small boat route that accesses it. Several of the units along the south shore of The Basin will have the same effect. Cosmos Cove would receive a major visual alteration under this alternative. This high-use anchorage would meet a VQO of Maximum Modification when viewed from within the cove. Some of the clearcuts and roads would also be visible to traffic along the marine travel route in Chatham Strait.

Log Transfer Facilities (LTFs) and Logging Camps

The large size, linear bold shape, and saltwater location of LTFs generally present a very strong visual impact when viewed within a foreground distance. Their relative low profile, however, helps to blend them into background views. Clearings for sort yards and logging camps also add to the visual impacts associated with LTFs; however, their location, which is usually on fairly level or gently sloping sites, helps to absorb much of their visual contrasts when viewed from saltwater. Floating logging camps are being considered for this project. Visual impacts from these are considered to be much less than more permanent upland camps.

Slide-type LTFs usually present less of a visual impact than larger bulkhead-type facilities. The bold form of the bulkhead associated with barge LTFs prevents it from blending into the surrounding landscape. Often, the type of material and color of the bulkhead creates strong contrasts that can be seen even in the background distance zone. Careful selection of materials and colors can effectively mitigate such contrasts.

Slide-type LTFs present less of a visual impact than larger bulkhead-type facilities.

The following logging camps are proposed under one or more of the alternatives.

Appleton Cove LTF

This LTF and land-based logging camp would likely be located on a small island in Appleton Cove on the site of a past LTF and camp. The site would meet a Partial Retention VQO as seen from Peril Strait. As seen from the anchorage in Appleton Cove, the bulkhead, floats, log storage, and logging camp itself would be highly visible and would meet a VQO of Maximum Modification. This LTF location would be used in Alternatives 2, 3, 4, and 5.

Saook Bay LTF

This LTF would be a reconstruction of an old LTF located near the head of Saook Bay on the south shore. The old LTF was rehabilitated and is not visually evident except for alder trees growing on the disturbed area. The logging camp would be located along the west shore of the tidal flat at the head of Saook Bay. These developments would be highly visible from the anchorage in Saook Bay and would meet a VQO of Maximum Modification. This LTF location would be used in Alternatives 2, 3, 4, and 5.

Hanus Bay LTF

This LTF would likely be located at the site of a past LTF within the anchorage at Hanus Bay. The LTF would meet a VQO of Maximum Modification as seen from the anchorage. The camp would be located about three-quarters of a mile northwest of the LTF along the shore of Peril Strait. The camp would meet a VQO of Modification as seen from the ferry route in the middle of Peril Strait if a beach fringe of trees is left to help mitigate its visibility. This LTF location would be used in Alternatives 2, 3, 4, and 5.

Bourbon Creek LTF

This LTF would be located near the mouth of Bourbon Creek on the site of a past LTF. This site would meet a VQO of Partial Retention as seen from the small boat route entering Middle Arm of Kelp Bay. The floating and upland camp would meet a VQO of Maximum Modification while in place. This LTF location would be used in Alternatives 2, 4, and 5.

North Point LTF

This LTF would be located on a previously undeveloped site in a small bight on the north side of the entrance to the South Arm of Kelp Bay. This LTF would meet a VQO of Maximum Modification while in use. This LTF location would be used in Alternative 5.

South Arm LTF

This LTF would be located on a previously undeveloped site near the head of the South Arm of Kelp Bay. This site is very steep; construction of the LTF and access road would require extensive rock blasting which would create a strong, long-lived visual impact as seen from the head of South Arm. This site would meet a VQO of Maximum Modification for about 20 years after construction, if rehabilitation measures are implemented. This LTF location would be used in Alternative 5.

North Basin LTF

This LTF would be located on the site of a past LTF. The LTF would meet a VQO of Modification from the small boat route within The Basin. The floating camp would meet a VQO of Maximum Modification while in place. This LTF location would be used in Alternatives 2, 4, and 5.

South Basin LTF

This LTF would be located on the site of a past LTF on the south shore of The Basin. The LTF would meet a VQO of Maximum Modification as seen from the anchorage in The Basin. This LTF location would be used in Alternatives 2, 4, and 5.

Cosmos Cove LTF

This LTF would be located on a previously undeveloped site on the south shore, just inside the entrance to Cosmos Cove. The LTF would meet a VQO of Maximum Modification as seen from the anchorage in Cosmos Cove. The floating and upland camp would also meet the VQO of Modification. This LTF location would be used in Alternatives 2 and 5.

Cumulative Effects and Long-Term Productivity

Overview

The potential for visual impact is greatest right after timber is harvested. In the foreground (up to 1/2 mile), stumps and debris are dominant. Activities associated with road construction, such as cut and fill slopes, rock pits, and turnouts, would be readily visible to the observer. As seen in the middle-ground (1/2 mile to 3 miles), vivid distinction in texture of the mature stand and the harvest unit would be apparent. Exposed boles and limbs of the adjacent stand would dominate the visual setting.

By the fifth year of regeneration, the new forest would be filling out with low-lying vegetation (berry bushes, ferns, etc.). In some cases, young alder would be present where disturbance occurred. In the foreground, the visual effects of the clearcut would be evident, but the shrubby vegetation and young trees would begin to cover over the stumps and exposed ground. In the middle-ground, the harvest unit would remain evident, with sharp contrast in color and texture.

Old-growth forest stand. After 100 years of regeneration, there would be little visual difference beween 100-year old forest stand and an adjacent overmature forest stand.

From year 5 to 20, the young trees would become established, reaching a height of approximately 15 feet. After 20 years, the forest visitor would see a healthy, thinned stand of spruce and hemlock, with some yellow cedar in the foreground. Views created with the original clearcut would become limited. The precommercial thinning process would create a well-defined stand. In the middle-ground, the contrast between the new forest and the mature forest would be very obvious.

At the end of 50 years, the new forest would reach a height of approximately 50 feet. As seen in the middle-ground, this stand would be approximately half the height of the existing mature stands, providing a smooth visual transition at the harvest unit boundary. Should new harvest occur adjacent to the 50-year stand, the effect would be an even less obvious transition. In the foreground, the growth of the stand would limit views beyond the original unit. At the end of 50 years, the canopy would be closing and the new forest would appear very dense.

Toward the end of 80 years, the stand would reach 75 percent of its mature height. From the middle-ground, there would be less distinction between this stand and adjacent mature forests. The canopy would appear full with crowns touching, allowing little sunlight to reach the forest floor and little understory vegetation. As seen in the foreground, tree boles with diameters of 23 inches would appear visibly dominant from the road; the canopy would be visible at approximately 30 feet from the forest floor. Roadside vegetation would include ferns and berry bushes.

At 100 years, little visual difference would be noticed between the 100-year forest and an adjacent overmature forest. Timber would reach approximately 100 feet in height and appear healthy, lush, and with full canopy. In the foreground, the new forest would be extremely dense, with little light reaching the forest floor. Selective harvest or small group selection may be necessary adjacent to recreational roads to allow additional sunlight, for safety purposes, or to increase vista opportunities. In the middle-ground, the color and texture of the new forest would allow distinction between it and adjacent overmature forests, which display a scattering of dead tops with generally more irregular tree-growth pattern.

Assuming a continuation of the present harvest level and implementation of resource constraints in accordance with the Forest Plan through the year 2090, timber harvest during this period would remove slightly more than 28 percent or 15,435 acres of the remaining Commercial Forest Land (CFL) in the Project Area. Inside the Project Area, 36.5 percent of this acreage or 5,634 acres are in extended rotation blocks. During this time, the forest would be in a continual state of obvious visual changes, the appearance of which would be as described above.

Following is a description of the visual condition of each VCU under the continued implementation of the TLMP and the long-term APC contract. These effects are based on the following assumptions relevant to estimating effects on the visual resource.

- Number of entries:

  There would be three entries made into the CFL without an extended rotation.

  There would be four entries made into Land Use Designation IV extended rotation areas over a 120-year period.

  There would be six entries made into Land Use Designation III extended rotation areas over a 200-year period.

- Laws, guidelines, and BMPs for resource protection would continue to be followed. Management requirements, mitigation, and laws are expected to be at least as stringent in the future as those that exist today.

- Timber sale planning would be done in an interdisciplinary fashion.

- All harvest would be done by the clearcut method.

VCU 293

The foreground areas around Appleton Cove, as well as, the middle-ground slopes east of the anchorage in Appleton Cove would be harvested in 4 entries over a 120-year period. This extended rotation would aid in reducing the adverse impacts and benefit meeting the inventoried VQOs. In Alternatives 2 and 5, this VCU would not be entered in the period from 1995 to 2011, a fact that would aid in meeting the inventoried VQOs. Timber stands along the shoreline and lower slopes from Point Benham to Saook Point would be harvested in a 100-year rotation with three entries. This impact would be noticeable to travelers on the marine route located in Peril Strait. Harvest activity would remain screened in most areas by the treeline located along the shore and impacts should be consistent with the VQO of Partial Retention. Much of the harvest activity that occurs up the drainage of the tributary to Appleton Cove would be unseen from the identified marine-use areas inside Appleton Cove. Impacts would range from Modification to Maximum Modification VQO.

VCU 294

The foreground slopes above the anchorage at the head of Saook Bay will be noticeably affected over the next 100 years. Four entries will be made into this area and viewers should expect to see alterations consistent with the VQO of Modification. Farther out in the mouth of Saook Bay, the timber stands around Point Kennedy will be entered into in a 120-year extended rotation to minimize visual impacts. Some of these entries will be screened by trees along the shoreline. Travelers on the marine route in Peril Strait should expect to see impacts consistent with a VQO of Partial Retention. Much of the shoreline and lower slopes from Point Kennedy to Point Moses will also be affected in the same way. Much of the harvest activity that will occur along the main tributary to Saook Bay will be unseen from the anchorage or marine-use areas. Some impacts will be noticeable to anglers fishing this tributary, however, and will range from Partial Retention to Maximum Modification. In Alternatives 2 and 5, this VCU would not be entered; consequently, this would allow the area to better recover from the visual impacts of timber harvest.

VCU 296

The timber stands located along the shoreline from the mouth the Twin Lakes drainage to the northwest end of Portage Arm are in a 200-year rotation and should remain in a naturally appearing condition as seen from the marine travel route. Stands located along the slopes above Twin Lake and Little Lake Eva will be moderately affected; viewers from the lake shores should notice alterations consistent with a Partial Retention to Modification VQO. Future harvest units on the east and west shores of Portage Arm will be interspersed with previously harvested units from previous entries, and changes associated with future harvest units should be consistent with a VQO of Modification. Harvest activity along the southern tip of Catherine Island and along the shores of Echo Cove will be evident to watercraft utilizing the small boat route in Kelp Bay and Portage Arm. Middle-ground views will be affected from the route in Kelp Bay and Portage Arm while foreground and middle-ground views will affect boaters inside of Echo Cove.

VCU 297

Timber harvest along the shores and lower slopes between Point Hanus to Point Thatcher will receive a minor visual impact. Most of these stands are placed in a 200-year extended rotation, with approximately 6 entries during that time, to alleviate potential impacts over the long term. Some of these impacts will be noticeable to boaters along the marine travel route located in Peril Strait, but impacts should be consistent with a VQO of Partial Retention. This portion of Catherine Island is characterized by valleys that have a low gradient along the stream course and steeply ascending mountains on either side. Timber harvest along the stream course should be mostly screened from the middle- and background views from the marine travel route and will meet a VQO consistent with Partial Retention. Timber harvest activities from Point Thatcher to Point Lull just off the shoreline and on the lower slopes should be screened by shoreline vegetation. The upper, more prominent slopes are in a 200-year rotation to lessen the visual impacts associated with harvest. Units in both these areas should meet a VQO of Partial Retention with minor impacts noticeable to boaters in the marine route in Chatham Strait.

VCU 298

Middle Arm of Kelp Bay will reflect a moderate amount of visual alteration over next 100 years. Harvest along the south shores will impact fore- and middle-ground views from the small boat route within Middle Arm; alterations should be consistent with a VQO of Modification. There are several areas in Middle Arm that are in 120-year extended rotation. One is located near the head of Middle Arm, and another is located on the south shore near the mouth. Impacts in these stands will be consistent with a VQO of partial retention when viewed from the small boat route. Timber harvest along the unnamed main tributary to Middle Arm will be mostly screened from view of the small boat route by topography and vegetation. Views from along the creek will be affected in a minor way and should meet the VQO of Partial Retention. However, views of anglers along Bourbon Creek will receive a moderate impact due to harvest operations and should be consistent with a Modification VQO.

VCU 314

Harvest activity along the northwest shore near the mouth of South Arm will be evident in the middle-ground views from the small boat route inside Kelp Bay. These slopes will reflect alterations that would be consistent with a Modification VQO. All other timber harvest within the viewshed of South Arm should reflect a VQO of Partial Retention due in part to the existence of several stands of 120-year extended rotation blocks along the east and west shores. The Clear River and Glacial River valleys are unseen from any of the marine-use areas. Timber harvest activity along these water courses would only have a minor effect on anglers fishing these streams and should be consistent with a Partial Retention VQO. Alternative 3 does not enter this VCU; consequently, if this alternative were chosen, VCU 314 would be maintained in its present condition. Only Alternative 5 proposes harvest at North Point and Clear River drainages.

VCU 315

The shoreline along The Basin already exhibits obvious alterations due to timber harvest. This area will continue to change through the end of this rotation. Viewers from the small boat route and the identified anchorages should expect to see alterations all along the shoreline and lower elevation slopes consistent with the VQOs of Partial Retention and Modification. Less impact will be noticed in the marine travel route in Chatham Strait in these areas due to the increased viewing distance of the disturbance. Most of the immediate shoreline in

Extended rotation management in Cosmos Cove will help reduce the noticeable impact of harvest activity.

this VCU, as well as the western half of Pond Island, are in a 120-year extended rotation where approximately 4 entries will be expected over that time. Alternative 3 does not propose harvest during this entry and would allow The Basin to further recover from the visual alterations from the last entry.

The extended rotation area in Cosmos Cove will help reduce the noticeable impact of harvest activity. The visible impacts within Cosmos should be consistent with a VQO of Partial Retention. Alternatives 3 and 4 do not consider harvest in Cosmos Cove during this entry. If either of these alternatives is chosen, The Basin would further recover from the visual alterations from last entry, and Cosmos Cove would retain its pristine character.

Roads and Facilities

Overview

Forest roads are classified in relation to their service life as either short term (10 years or less design life) or as long-term (greater than 10 years).

Short-term and temporary roads are developed and operated for a limited period of time and cease to exist as a transportation facility after the purpose for which they were constructed is completed. When the need for access provided by these roads has ended, the drainage structures will be removed and the roadbed will be waterbarred and seeded, as necessary, as required by the timber sale contract. These roads would not be included in the forest transportation inventory system (TIS).

Long-term or forest development roads are developed and operated to provide either continuous or periodic access for long-term land management and resource utilization needs. These roads are constructed under either the terms of timber sale contracts or by means of formal road construction contracts. Between periods of commercial timber haul, these roads will be maintained as prescribed by their Road Management Objectives (RMOs) for future resource access needs. Maintenance strategies may range from the roadway being continually graded and kept open for incidental traffic, to intermittent periods of closure during which the encroachment of natural vegetation is allowed. In all cases, the drainage structures will be maintained to protect natural resources. During periods of closure, those repairs needed to protect the investment and preserve structural integrity will be performed. Along the roadway, maintenance would be performed only as needed to facilitate restoration of the roadway for future use and to alleviate erosion or sedimentation. Such maintenance would include the application of grass seed to the roadbed.

Because of the isolated and dissected nature of the land suitable for growing trees in Southeast Alaska, very few roads connect to the larger towns where the pulp and lumber mills are located. In order to efficiently harvest timber, logging camps and associated facilities are constructed at remote locations. These remote sites are generally colocated with LTFs. The previous section described in detail the effects to the environment of constructing the LTFs; this section provides a description and analysis of the effects to the environment of constructing associated camps and sort yard facilities, if an action alternative were to be selected.

Direct Effects

Roads

Road projections were developed for each of the alternatives and are illustrated in Table 4-67. Existing roads refer to roads that were system roads at one time, but have been allowed to naturally regenerate after the drainage structures were removed. These roads, if identified for re-entry, would require reconstruction before re-use. Not all previously existing roads would be needed for this or future entries.

Table 4-67
Proposed Road Construction and Reconstruction by Alternative (in miles)

	Alternative								
	1	2		3		4		5	
VCU	Existing Rd	New Rd	Reconst. Rd	New Rd	Reconst. Rd	New Rd	Reconst. Rd	New Rd	Reconst. Rd
293	12.54	19.31	4.74	26.53	7.67	19.23	4.74	28.21	7.67
294	3.75	15.66	2.94	21.58	2.94	15.81	2.94	23.26	2.94
295	0	0	0	0	0	0	0	0	0
296	12.24	13.68	8.41	6.75	5.50	5.49	5.50	12.06	5.42
297	10.16	26.87	8.41	16.47	6.41	16.57	8.41	27.33	8.84
298	5.82	4.32	4.44	1.17	0	4.36	1.22	5.25	4.32
314	1.27	0	0	0	0	0	0	6.41	0.92
315	7.51	10.10	1.00	0.04	0	0.04	1.82	13.83	3.60
	53.29	89.94	29.94	72.54	22.52	61.50	24.63	116.35	33.71
Combined Total	53.29	119.88		95.06		86.13		150.06	

SOURCE: Costa, 1991.

Table 4-68 displays the proposed specified new construction, specified reconstruction, and temporary roads planned by alternative.

Table 4-68
New Construction, Reconstruction, and Temporary Roads (in Miles)

	Alternative			
Roads	2	3	4	5
Specified New Construction	73.04	55.25	49.94	87.76
Specified Reconstruction	29.94	22.52	24.63	33.71
Temporary	16.90	17.29	11.56	28.59
	119.88	95.06	86.13	150.06

SOURCE: Costa, 1991.

The environmental consequences from forest development roads can be described in two general concepts: (1) road density, and (2) acres of forest removed from natural resource production by roadway clearing activities. Road density is defined by the number of miles of forest development roads in a square mile. Generally, the higher the road density, the higher the rate of environmental impacts. Road density environmental impact risks are minimized and mitigated by standards and guidelines (see Appendix C) which direct the road location, design, construction, and operation. Table 4-69 displays current road densities and projected road densities by alternative.

Table 4-69
Road Density[1]

VCU	Alternative 1	2	3	4	5
293	0.58	1.48	1.82	1.48	1.90
294	0.10	0.52	0.68	0.53	0.73
295	0	0	0	0	0
296	0.49	1.03	0.76	0.71	0.97
297	0.41	1.50	1.08	1.08	1.52
298	0.13	0.23	0.16	0.23	0.25
314	0.02	0.02	0.02	0.02	0.14
315	0.57	1.33	0.57	0.57	1.61
Avg.	0.22	0.60	0.52	0.48	0.71

SOURCE: Costa, 1991.

[1] Road density is defined as the miles of road per square mile.

The clearing widths required for forest road development are dictated by the steepness of the terrain and the road design standard. Steeper terrain generally requires wider clearing limits resulting in a greater number of acres cleared or removed from natural resource production. Access roads are 14 feet wide, and on average the cross-slope of 40 to 60 percent, yielding an average of 6 acres of clearing per mile of road. Long-term roads will be maintained for future resource access, so land cleared for these roads will be removed from natural resource production. Upon completion of logging, short-term roads and temporary roads will have their drainage structures removed, the roadway would be seeded to control erosion, and allowed to deteriorate to once again return to natural resource production. Table 4-70 compares road clearing in each VCU by alternative, displayed for both initial roading and long-term roading acres.

Table 4-70
Road Clearing Acres For Initial and Long-term Roads[1]

VCU	Alt. 1 Init.	Alt. 1 Long Term	Alt. 2 Init.	Alt. 2 Long Term	Alt. 3 Init.	Alt. 3 Long Term	Alt. 4 Init.	Alt. 4 Long Term	Alt. 5 Init.	Alt. 5 Long Term
293	75	0	144	83	205	93	144	90	215	84
294	23	0	112	75	147	77	112	78	157	77
296	73	0	132	106	74	49	66	59	105	29
297	61	0	212	155	137	104	150	105	217	137
298	35	0	53	32	7	7	33	29	57	36
314	8	0	0	0	0	0	0	0	44	18
315	45	0	67	53	0	0	11	11	105	75
Total	320	0	720	504	570	330	516	372	900	456

SOURCE: Costa, 1991.

[1] Long-term Roads: Roads needed for future resource management needs. Initial Roads: Refers to all roads (long- term, short-term, and temporary).

Alternative 5 would affect the most area with 900 acres initially being taken out of production with roading and would also have the highest road density per square mile of area. Alternative 5 represents higher initial reading clearing in the present, but would be beneficial for future harvest activities in that the roads would be in place. Alternative 2 proposes the second highest level of impact with 720 acres initially taken out of production. Because of the more scattered approach of this alternative, more acres will remain out of production (504 as opposed to 456 for Alternative 5). This is due to greater amounts of harvest scheduled in the foreseeable future with Alternative 2.

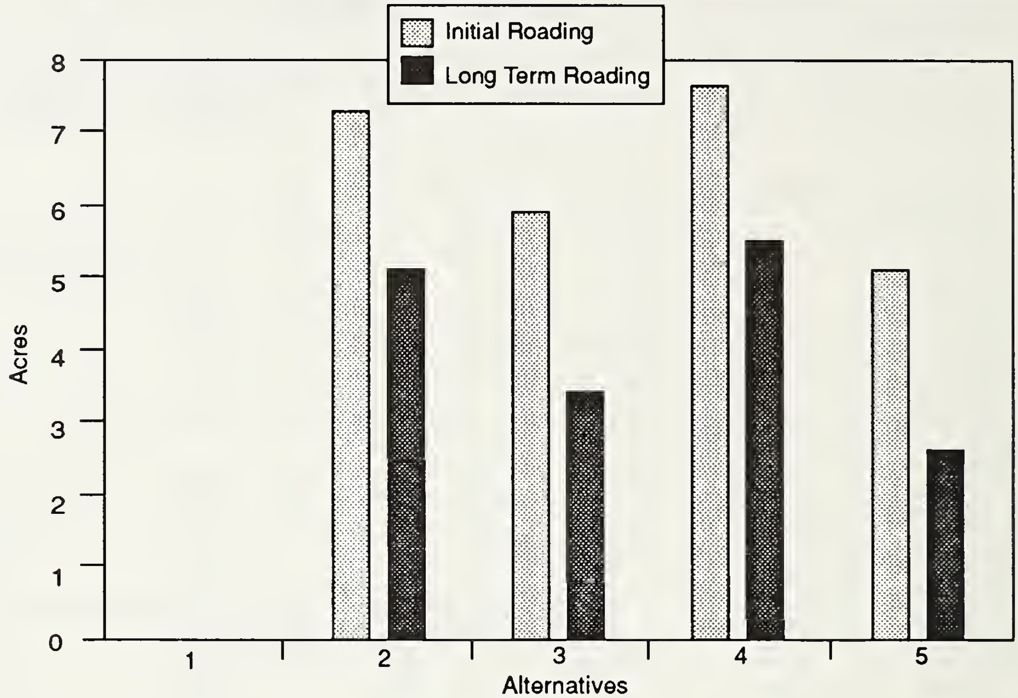
Alternative 3 proposes the third highest level of impact, with 570 acres initially taken out of production. Because harvest is confined to a smaller area, it also has the least acres taken out of production over the long-term. This alternative also completes the scheduled harvest in two of the VCUs entered. Alternative 4 has the least acres initially roaded, and similar to Alternative 2 would have a higher amount of volume scheduled for harvest in the foreseeable future.

Figure 4-23 displays the acres of land disturbed due to roading activities in relation to the amount of timber harvested under each alternative. When adjusted for volume harvested by alternative, Alternative 4 has the highest initial acres and the highest long-term acres disturbed. Alternative 5 has the lowest initial and long-term acres disturbed.

Logging Camps and Sort-yard Facilities

Of the nine LTFs studied in the Kelp Bay Planning Area, six are planned to have logging camps. Three will be ground-based camps; three will be ground-based and float camp-type; and the remaining three would be worked out of adjacent camps. Table 4-71 presents a breakdown of the LTFs and associated camps by alternative.

Figure 4-23
Acres of Disturbance by Roading per Million Board Feet of Timber Harvested (acres/MMBF)



SOURCE: Costa, 1991.

Table 4-71
Camps, LTFs, and Estimate Life Cycle

VCU	LTF	Camp Type	Alternatives	Use Frequency
293	Appleton Cove	Ground based	2,3,4,5	Intermittent
294	Saook Bay	Ground based	2,3,4,5	Intermittent
296/297	Hanus Bay	Ground based	2,3,4,5	Continuous
298	Bourbon Creek	Ground and partial float	2,4,5	Intermittent
314	South Arm	Worked from the Bourbon Creek camp	5	Intermittent
314	North Point	Worked from the Bourbon Creek or Basin camp	5	Intermittent
315	North Basin	Ground and partial float	2,4,5	Intermittent
315	Cosmos Cove	Ground and partial float	2,5	Intermittent
315	South Basin	Worked from the North Basin Camp	2,4,5	Intermittent

SOURCE: Costa, 1991.

Each logging camp and sort-yard facility has a different effect on the landscape depending upon surrounding terrain and amount of volume attributable to the facility. A description of the effects each facility would have on the landscape is presented below. Impacts are expressed in acres needed for the camp and sort-yard facilities. These acres would be removed from timber production, at least through the end of the foreseeable future. Other direct effects from logging camps and sort-yard facilities, such as competition for subsistence resources, limitation of anchorages by recreational users, etc., are discussed under the respective resource sections.

Appleton Cove

This site was previously used from 1964 to 1966. The former camp site is currently covered with alder and brush. An estimated 12 to 15 trailers, some home- family-type and the rest bunkhouse-type, would be located here year-round for approximately 3 operating seasons. This camp is estimated to house between 25 and 40 people at any one time. Water and sanitation facilities would have to be built to support this size of facility, which is considered about average for a ground-based camp in Southeast Alaska.

With this many people, it can be assumed that some would include families with children, which would require an additional facility for educational purposes. In order to supply such a camp, a boat ramp and/or float dock for aircraft would also have to be part of the camp design. An upland facility of this size requires approximately 3 acres, with an additional 5 acres needed to facilitate activities in the log sort yard and fuel storage areas.

The sort yard would be adjacent to the LTF which is located on basically flat ground. The fuel storage area and tanks would have spill containment as required by State law and would be located to one side of the sort-yard area. No streams flow through the area and the sort yard is located on a small island; risk of contamination from fuel spillage is minimized to both saltwater and freshwater sources.

Use of this camp would be needed under all action alternatives. Duration would be approximately 2 years for Alternatives 2 and 4, and up to 4 years under Alternatives 3 and 5.

Saook Bay

This camp is isolated from other LTF sites, as is common in such Southeast Alaska facilities; thus, it would need its own sort yard, water and sanitation services, and fuel storage areas to support timber harvest operations. The former logging camp was located on the edge of the estuary less than a quarter of a mile upstream from the old LTF. It is estimated that 12 to 15 trailers, some family-home and some bunkhouse-type, would be located here. There is a good size drainage flowing through the camp area providing water. It is estimated that between 25 and 40 people would be working out of this camp during periods of peak activity. The road crew will probably begin operations before the logging crew. With the mixture of families and bunkhouses, it is assumed a schoolhouse would be needed for educational purposes. To supply such a camp, a boat ramp and/or float dock for aircraft would also have to be part of the camp design. This camp area would be approximately 4 acres in size.

A sort yard about 3 acres in size was located between the camp and the LTF site and would be reused with any of the action alternatives. Fuel storage would be located closer to the LTF site and away from the camp water source on the edge of the sort yard area. The fuel storage area and tanks would have spill containment, as required by State law, minimizing the risk of contamination to estuary or saltwater areas adjoining the camp.

Anderson Island in Appleton Cove. This former LTF location would likely be re-used for all action alternatives.

All action alternatives would require use of this camp and sort-yard facility. Duration of use would range from 2 years under Alternatives 2 and 4, and up to 5 years under Alternatives 3 and 5.

Hanus Bay

The Hanus Bay camp was located adjacent to the LTF on flat lands. Water was in short supply the last time a camp was located in this area. If all the drainages within a quarter mile stretch were tied together into a single water system for the camp, enough water would be ensured for future use of this area. This camp would be planned for use on a more regular basis due to the large amount of suitable timber attributable to this LTF. Because of the large area tributary to this LTF, it is anticipated that both road building and timber logging crews would be working out of the camp at the same time.

The camp would cover approximately 4 acres and the logging/sort yard area approximately another 4 acres, for a total of 8 acres. It is anticipated that 15 to 18 trailers would be located here at the peak of activity, housing a slightly larger crew than facilities planned for Appleton Cove or Saook Bay. This larger camp size is expected to house a mixture of families with children and crews. A trailer for a schoolhouse would also be needed here. A utility ramp for unloading the trailers, logging and road-building equipment would also be needed and would be part of the camp design. Provisions for a boat ramp/float dock facility would also be needed to handle year-round transportation of people and supplies.

Fuel storage would occur at the upper end of the sort yard area, farthest from the beach and away from freshwater streams. As required by State law, fuel storage would be in a containment area to prevent accidental spillage from contaminating adjacent freshwater or estuary habitats.

All action alternatives would require the use of this camp and sort yard facility. Duration of use would range from 2 to 3 years under Alternatives 3 and 4 and up to 5 years under Alternatives 2 and 5.

Bourbon Creek

This LTF and associated camp were constructed in 1974 and last used in 1977. This camp would support 12 to 15 trailers plus a floating camp, for a total crew size of 25 to 40 people. There is an anadromous fish stream which flows between the sort-yard area and the old camp which is anticipated to have a bridge installed to allow for fish passage. This stream would also provide the water for the camp. The old site could be expanded to accommodate more trailers, and/or a floating camp would have to be anchored off in the next bight north of the proposed LTF site. A short road would have to be built from the LTF to the float camp. As with the other camps, a trailer for a schoolhouse would be needed here.

This would be a year-round camp that would need a boat/float plane dock or ramp for use by camp residents. Because of land restrictions at two other nearby locations, South Arm and North Point, this camp could also support those operations. It is conceivable that both road building and logging crews could work out of this camp at the same time. In addition, because it would be likely for two other timber harvest operations to work out of here, crew boats would need to dock at this camp. An access ramp in conjunction with the LTF would be needed to unload the trailers, logging, and road building equipment.

The sort-yard area would cover approximately 4 acres, and would include a containment area large enough to store fuel away from the anadromous fish stream crossing to minimize the risk of spillage and environmental damage.

It would take approximately 1 year to harvest the timber offered under Alternative 4, and up to 3 years for road construction and timber harvest under Alternatives 2 or 5.

Estuary at the mouth of Clear River. Only Alternative 5 proposes to construct a LTF in South Arm of Kelp Bay.

North Point

Due to the limited amount of upland area present at this site, no logging camp would be located here. This would be a new facility which could be supported from the camp located at Bourbon Creek or at North Basin. A smaller trailer for a watchperson may be located at this site for security purposes. Water is available south of the site approximately 300 feet from the LTF. Because the crews would be housed at another location, this facility would require construction of a boat docking facility.

The rock pit area resulting from road construction would be converted into the sort-yard area, 4 acres in size, and tiered to reduce impacts of construction. The fuel storage area would include the State-required containment structure and be located away from the beach in the back of the rock pit area.

North Point would only be used if Alternative 5 were selected and it is estimated that only one year would be required to build roads and complete the harvest.

South Arm

This new LTF site has limited upland area; therefore, no logging camp would be feasible here. Plans at this time are to have crews harvesting timber in South Arm housed at either the Bourbon Creek or North Basin camps. The crews would probably use crew boats to shuttle back and forth between the work site and housing location. A boat ramp/float plane dock would need to be part of the LTF configuration to accommodate the movement of crews and supplies.

Because of the limited area at the LTF, the sort yard, if needed, would have to be at the top of a hill, prior to dropping down to the LTF itself. This sort yard would be approximately 4 acres in size and be tucked behind the hill, out of sight from the anchorage in South Arm. The fuel storage area would probably be located in the sort yard, the top of the hill, well away from Clear River, an important anadromous fish stream. There is also a bald eagle nest tree located between the beach and the road to the top of the ridge.

Alternative 5 is the only alternative which proposes harvest in Clear River. This would require about 2 years of activity for the combination of road building and logging. Choosing harvest in this area would have to be done in conjunction with operations at either Bourbon Creek or North Basin camps.

North Basin

This site was constructed in 1975 and last used in 1977. A slide-type LTF is planned. The original camp consisted of about eight trailers and a small floating camp. Current plans would be for about 12 trailers, some home families and some bunkhouse-type, plus a floating bunkhouse. It is estimated that about 20 people would work out of this camp, a slightly smaller crew than estimated for the other locations. Operations for the South Basin LTF would be supported from this camp. There is a small water supply adjacent to the camp. The float camp would probably be anchored off to the north of the LTF, and would need less than 0.25 miles of road built to make it accessible from the main camp. An unloading ramp for trailers, logging equipment, and supplies would need to be constructed. A boat ramp/float plane dock would also be part of the LTF configuration to support transport of camp residents and supplies year-round. A boat docking area would also be needed for the transport of people to the South Basin, South Arm, or North Point areas.

The rock pit area behind the old camp would be expanded and used as a sort yard, as was done in the past. Fuel storage would be in the sort-yard area, within a containment structure to minimize the risk of fuel contamination to adjacent salt-water habitats.

Depending on which action alternative is selected, this camp would be used for a period ranging between 1 year under Alternative 4, to between 2 and 3 years with Alternatives 2 and 5.

South Basin

This area was harvested in 1976 to 1977, but no upland camp was located here. The crews stayed at the North Basin LTF camp and boated back and forth. The old sort yard area was approximately 3 acres in size and is located adjacent to the LTF. The fuel storage area would be located at the back of the sort yard area, away from the beach.

Alternatives 2 and 4 allow for the harvest of 3 MMBF at this time, with an additional 5 MMBF planned around 2011. Alternative 5 would allow the harvest of 8 MMBF, which could be accomplished in one season.

Cosmos Cove

There is a large flat area of land adjacent to the LTF site which would accommodate both the sort yard area and a small camp. The camp area would be approximately 2 acres in size. This camp would have 6 to 8 trailers, plus a bunkhouse-type float camp anchored just west of the LTF to house a small crew of 10 to 25 people. A boat ramp/float dock would be part of the LTF design to accommodate transportation of camp residents and supplies year-round. The sort yard and fuel storage area would be approximately 3 acres in size.

Preliminary rock source investigation in the area indicates that road building would have to begin at the northwest end of Cosmos Cove and proceed towards to the LTF site as rock is generated at the rock source. This would require the unloading of equipment at the head of Cosmos Cove for a short time until the road can be built to the planned LTF.

Harvest in Cosmos Cove would only occur under Alternatives 2 and 5. Both alternatives plan to harvest 4.5 MMBF with this entry. This amount can be harvested in one season, but could take two because of the required amount of road building. An additional 2 to 4 MMBF could be harvested by the year 2011.

Indirect and Cumulative Effects

Table 4-72 displays the miles of road that will be needed to access the volume projected for harvest by year 2011, the end of the foreseeable future. These miles were developed using the remaining volume scheduled for harvest in each of the VCUs and the road density factors for each VCU.

Table 4-72
Miles of Road Needed to Access Projected Harvest by 2011

	Alternative									
	1		2		3		4		5	
VCU	This Entry	By 2011	This Entry	By 2011	This Entry	By 2011	This Entry	By 2011	This Entry	By 2011
293	0	31.45	24.05	34.05	34.20	34.20	23.97	36.77	35.88	35.88
294	0	27.46	18.60	31.10	24.52	24.52	18.75	34.75	26.20	26.20
296	0	27.59	22.09	30.19	12.25	25.15	10.99	21.39	17.48	21.28
297	0	32.88	35.28	47.28	22.88	41.88	24.98	40.38	36.17	41.87
298	0	20.69	8.76	16.66	1.17	13.47	5.58	15.68	9.57	13.27
314	0	14.54	0	7.00	0	11.20	0	9.00	7.33	10.63
315	0	21.51	11.10	18.50	0.04	11.80	1.86	9.50	17.43	20.93
Total	0	176.12	119.88	184.78	95.06	162.22	86.13	167.47	150.06	170.06

SOURCE: Costa, 1991.

By the time all scheduled timber is harvested, the final mileage of road built in each VCU will vary only slightly. This difference is attributable to the manner in which the Forest Service can mitigate the various issues presented.

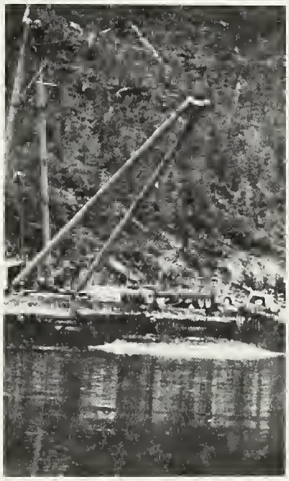
Marine and Log Transfer Facilities

Overview

Because of the isolated and dissected nature of the land suitable for growing trees in the Kelp Bay Project Area, very few roads interconnect between bays or islands. None connect to the larger towns where the pulp and lumber mills are located. The primary method by which logs are transported is by log rafts or by barging over the ocean. LTFs can be either low-angle slides or bulkhead type structures used for transferring logs from land transportation (trucks) to saltwater.

Two general types of facilities and their associated effects on the environment are analyzed. The first type of LTF is a low-angle slide. This facility varies in direct impact to the intertidal area with rock riprap and fill from 0.25 acres to 0.5 acres.

The second type of facility considered in this analysis is a bulkhead facility with a lift-off system. The lift-off system may be either a single or double A-frame. This type of facility ranges in direct impact to the intertidal area with bulkhead construction and fill from 0.1 acres to 0.25 acres.



A double A-frame log transfer facility.

Of the two designs, the slide design is less expensive to construct, maintain, and operate. The costs of constructing a bulkhead and associated rigging for either a single or double A-frame facility is approximately three times that of the construction of a low-angle slide. Maintenance of a timbered bulkhead facility would require replacement at approximately 10-year intervals, thereby substantially increasing the costs of future harvests (Faris and Vaughan, 1985). Concrete bulkheads can be substituted for timbered bulkhead structures, also at a higher cost.

Historically, the Peril Straits and Kelp Bay areas are subjected to Taku winds (winds reaching up to 100 miles per hour), intermittently causing windthrow to standing timber. In the Appleton Cove, Saook Bay, and Hanus Bay areas, this could amount to a loss of approximately 1 MMBF per high wind storm. It is reasonable to expect that windthrow will occur intermittently in the future. A low-angle slide facility would best serve windthrow salvage harvests, usually accomplished with small business operators. The substantially smaller investment in equipment to do this type of logging is more in line with a small operator's budget than would be a single or double A-frame operation. The slide design also has the benefit of assessing a low profile, causing less visual impact (Monaco, 1991).

The bulkhead facility is particularly effective where it drops off into relatively deep water. Initially, it creates a smaller affect on the intertidal area from rock fill, but has a higher operation and maintenance cost (Faris and Vaughan, 1985). Bulkhead facilities also have higher visual impacts because of the vertical log or concrete abutment (Monaco, 1991).

Potential impacts from proposed LTFs are analyzed for both marine and estuarine systems. In both systems, the areas are subdivided into the subtidal and intertidal zones. The intertidal zone is exposed and flooded by tides and includes the associated splash zone, while the subtidal zone is continuously submerged (Cowardin et al., 1979). In general, the estuarine systems are more productive than marine systems, and the intertidal and shallow subtidal area is the most productive portion of the coastal sub-zones (Odum, 1970).

The importance of loss in productivity in an estuary due to accumulation of bark debris is difficult to assess. In large estuaries, the importance of this loss is diminished, because the percentage of unaffected area is large compared to the amount lost. In a small estuary (or in a bight or cove within a large estuary), the loss of productivity may cause deterioration in the remaining areas, at least temporarily (Schultz and Berg, 1976). The basis for comparing LTFs and the possible effects on the marine environment were derived from subtidal surveys conducted jointly by the U.S. Fish and Wildlife Service and the National Marine Fisheries Service.

Direct Effects

Direct effects to the marine environment are those that occur in the same time or same place as the current timber harvesting and road constructing activities. In terms of LTFs, direct effects are limited to the intertidal area affected by rock fill, and either the intertidal or subtidal areas potentially affected by accumulation of bark debris. In most cases, the intertidal zone affected by rock fill for the facility would range from 0.1 acres up to 0.5 acres. Bark debris accumulation varies from location to location depending on slope of the benthic

bottom, plus tidal and wave action. Where bark debris information is available, it is noted in tables. Where that information is not available, the impacts are estimated to be comparable to LTFs nearby, or to be less than approximately 1.96 acres (a regional average based on a study of 32 LTFs in Southeast Alaska) (Faris and Vaughan, 1985).

In general, areas within estuaries are more sensitive to disturbance from LTFs than those located on marine systems. Species diversity is an indication of quality of habitat, which means locations with greater diversity would indicate better habitat (Schultz and Berg, 1976). LTFs located in areas with higher numbers of species generally exhibit higher value habitat than those with lower numbers of species present along the transect.

At all investigated locations, the species found along the estuarine and the marine system transects are commonly found throughout the coastal waters of Southeast Alaska. Many species range as far south as California and Mexico (Burns, 1991). Figure 4-24 shows which LTFs would be needed for each of the alternatives.

Figure 4-24

Comparison of LTFs Needed for Each Alternative

		Alternatives				
VCU	LTF Name	1	2	3	4	5
293	Appleton Cove *or* [1]		●	●	●	●
293	SE Rodman Bay *or*					
292	Rodman Bay					
294	West Saook		●	●	●	●
296/297	Hanus Bay *or* [2]		●	●	●	●
296/297	North Hanus Bay					
298	Bourbon Creek		●		●	●
314	South Arm					●
314	North Point					●
315	North Basin		●		●	●
315	South Basin		●		●	●
315	Cosmos Cove		●		●	●
	Total LTFs	0	7	6	6	9

SOURCE: Burns, 1991.

1 Only one of the three LTFs under consideration in the Appleton Cove area would be constructed to support transfer of logs to saltwater for the action alternatives.

2 Only one of the two LTFs under consideration in Hanus Bay would be constructed to support transfer of logs to saltwater for the action alternatives.

Estuarine Systems

Table 4-73 shows the LTFs for all alternatives and their estimated direct effects to the estuarine system.

Table 4-73
Log Transfer Facilities and Estimated Direct Effects to the Estuarine System

VCU	LTF Name	Estuary Acres	Species Diversity	Proposed Facility	Estimate Acres of Impact Fill	+ Bark	= Total
293	Appleton Cove	439	14	Slide	0.5	0.9	1.4
296/297	Hanus Bay	149	14	Slide	0.5	0.9	1.4
314	South Arm	356	10	Bulkhead	0.3	0	0.3
Total		944	—		1.3	1.8	3.1

SOURCE: Burns 1991.

Each of the estuaries affected are larger than 100 acres and would have greater ability to absorb impacts to a minute area within the individual estuary (Schultz and Berg, 1976). Species diversity for each of the proposed estuarine locations is low to moderate, ranging from 10 to 14 species along the 100-meter transect (Hughes and Peterson, 1990). At each of the proposed LTF locations, the percentage of estuarine benthic habitat subject to direct effects would be less than 1 percent. This small percentage represents a minor amount of the total available estuarine habitat (Burns, 1991).

All of the action alternatives would require that LTFs be developed for Appleton Cove, Rodman Bay (VCUs 292 or 293), or for Hanus Bay (VCUs 296 and 297). If the former LTF locations are developed, then impacts to these areas would represent a loss of less than 1 percent of the estuarine habitat tributary to each LTF. If alternate locations were developed for these VCUs, then no impacts would occur to the estuarine environment in Appleton Cove (VCU 293) and Hanus Bay (VCUs 296/297). Only Alternative 5 proposes LTF development adjacent to the estuary at the head of South Arm. Regardless of the alternative selected for implementation, the net loss to estuarine habitat would individually or collectively be less than 1 percent. Since all species present during the subtidal survey are common to all shorelines in Southeast Alaska, the effects of a less than 1 percent decrease would be negligible.

The remaining nine LTFs would be located in marine system environment. There are roughly 165 miles of shoreline in proximity to proposed LTF locations in the Kelp Bay Project Area, providing an abundance of marine system habitat. (As noted in Chapter 3, miles of shoreline as it relates to marine habitat is greater than for recreation or other project analysis. This is due to consideration of LTFs in Rodman Bay, which adjoins the Project Area.) There is an average of 46 acres of habitat per mile of shoreline. This would translate to approximately 7,700 acres of habitat. Direct effects to 19.9 acres out of 7,700 acres of similar habitat would be less than 0.5 percent of the total. Because this is such a small percentage of the habitat, and all of the species found along survey transects are common species, this impact is viewed as negligible (Burns, 1991).

Marine System

Table 4-74 shows LTFs for all alternatives and the estimated direct effects to the marine system.

Table 4-74
Log Transfer Facilities and Estimated Direct Effects to the Marine System

VCU	LTF Name	Miles of Shoreline	Species Diversity	Facility Type	Estimate Acres of Impact Fill +	Bark	= Total
293	SE Rodman Bay	20	23	slide	0.5	1.0	1.5
292	Rodman Bay	20	16	bulkhead	0.3	2.8	3.1
294	Saook Bay	15	23	bulkhead	0.3	1.0	1.3
296/297	North Hanus Bay	50	20	bulkhead	3.5	0	3.5
298	Bourbon Creek	15	16	slide	0.5	1.0	1.5
314	North Point	13	17	slide	0.5	1.0	1.5
315	North Basin	9	17[1]	slide	0.5	<2.0	<2.5
315	South Basin	17	17	slide	0.5	<2.0	<2.5
315	Cosmos Cove	6	9	slide	0.5	<2.0	<2.5
Total		165	—		7.1	12.8	19.9

SOURCE: Burns 1991.

[1] A subtidal survey was not conducted on North Basin in 1990. It is assumed this location is similar to the South Basin location.

Comparison of Alternatives

Because Alternative 1 is the No-action Alternative, there would be no direct effects from developing LTFs at this time. Alternative 2, if selected for implementation, would propose construction of 7 LTFs. Maximum direct impacts would be 0.48 percent of the estuarine environment in Appleton Cove and Hanus Bay. A total of 15.3 acres (0.21 percent) of the marine system environment would be affected if neither LTF in the estuary were constructed. Loss of habitat at each of the LTF sites represents less than 1 percent and is considered very minor.

Alternative 3, if selected for implementation, would propose construction of 3 LTFs. Maximum direct impacts would be 2.8 acres or 0.48 percent of the estuarine environment in Appleton Cove and Hanus Bay. In contrast, a total of 7.9 acres (0.11 percent) of the marine system environment would be impacted if neither LTF in the estuary were constructed. Loss of habitat at each of the LTF sites represents less than 1 percent and is considered very minor.

Alternative 4, if selected for implementation, would propose construction of 6 LTFs. Maximum direct impacts would be 2.8 acres pr 0.48 percent of the estuarine environment in Appleton Cove and Hanus Bay. If neither LTF were constructed within the estuaries, a total of 14.9 acres (0.20 percent) of the marine system environment would be affected. Loss of habitat at each of the LTF sites represents less than 1 percent and is considered very minor.

Alternative 5, if selected for implementation, would propose construction of 9 LFTs. This alternative would construct a LTF in the head of South Arm in addition to Appleton Cove and Hanus Bay. Maximum direct impacts would be 3.1 acres or 0.32 percent of the estuarine environment. If the LTFs in Hanus Bay and Appleton Cove estuaries were avoided, there would be a direct impact to 18.4 acres (0.24 percent) of the marine system habitat. Loss of habitat at each of the LTF sites represents less than 1 percent and is considered very minor.

Analysis of the effects on estuarine and marine system habitats were negligible for all LTFs under all action alternatives. It is clear that the basis for deciding location of LTFs, then, resides with other factors. A detailed comparison of each proposed LTF with the Log Transfer Facility Siting, Construction, Operation, and Monitoring/Reporting guidelines is included in Appendix I (Burns, 1991).

Indirect and Cumulative Effects

All alternatives project the need for LTFs in the foreseeable future. It is likely that these facilities would remain in place through the end of the contract period, as opposed to pulling the structures and putting them back in place for future harvests. Normal maintenance would occur, similar in objective to road management.

During the scoping process, there was strong public preference for the Forest Service to reuse existing LTF locations, rather than construct new ones. This is considered an indirect effect as opposed to a direct effect. Six of the proposed LTF locations would satisfy this public concern. These locations are Appleton Cove, Saook Bay, Hanus Bay, Bourbon Creek, North Basin, and South Basin.

One new LTF, the Cosmos Cove site, would need to be constructed if Alternative 2 were selected for implementation. If Alternative 5 were selected, three new LTFs would be needed: South Arm of Kelp Bay, North Point, and Cosmos Cove.

The indirect effects of reconstructing an LTF on a previous site would be potential accumulation of more bark on top of the area currently covered with bark (if any). Area of bark coverage is not expected to increase beyond those currently noted in either the 1990 or the 1976 subtidal surveys. The effects of placing rockfill are direct effects and are discussed in the previous section.

In situations where new facilities are being proposed, there would be no indirect effect from bark accumulation, because these would be considered direct effects. In addition, the *Direct Effects* section discusses situations where alternative LTF locations are being proposed, instead of reusing the former locations. This would include proposed LTF locations at southeast Rodman Bay, North Hanus Bay, either location at South Arm, and Cosmos Cove.

Recolonization rates of old sites are not known; it is also uncertain whether or not the habitat is recolonized by the original species present before bark deposition occurred. The length of time that debris remains in place after a site becomes inactive is not known and is likely to be highly variable due to differences in wave and tidal action. Bark and debris decay slowly and can remain for many years because of cold-water temperatures (Faris and Vaughan, 1985). In places like Appleton Cove and Hanus Bay, the subtidal survey report shows King and/or Dungeness crab inhabiting the area despite bark deposits (Hughes and Peterson, 1990), and it is expected they would continue to do so.

An analysis of the South Basin LTF location in Kelp Bay indicated that recolonization had occurred approximately 12 to 15 years after the site was abandoned. Species found on this location were comparable to those at locations never used for transfer of logs, such as North Point (Burns, 1991).

Cumulative effects are the combined effects of past, present, and foreseeable future actions. Rockfill for either a slide or a bulkhead facility would not increase or decrease based on log facility use, and those effects are addressed in the *Direct Effects* section. Bark depth may increase slightly, but area of coverage would not be expected to increase with reuse of the old LTF sites.

Cumulative effects would be greater for VCUs 292/293 if new locations were selected for development rather than returning to former LTF sites. In VCUs 292/293, this would indicate a range of cumulative effects from 4.5 acres currently affected at the Rodman Bay and Appleton Cove LTFs, to 6.0 acres cumulatively effected if the southeast Rodman Bay location would be selected instead of either former location. Additional cumulative effects would occur should extra road construction be required to either the Rodman Bay LTF or the Southeast Rodman location from Appleton Cove. In summary, there would be fewer cumulative effects from reusing the Appleton Cove LTF than from either reusing the Rodman Bay LTF or developing the Southeast Rodman location.

Cumulative effects would be greater for VCUs 296/297 if a new location were selected for development rather than returning to former LTF sites. In VCUs 296/297, this would indicate a range of cumulative effects from 1.4 acres currently impacted at the Hanus Bay LTF, to 4.9 acres cumulatively affected if the North Hanus Bay location would be selected instead of the former location. In summary, there would be fewer cumulative effects from reusing the Hanus Bay LTF than from developing the North Hanus location in addition to the previous impacts at Hanus Bay.

Schultz and Berg (1976) suggest that this periodic dumping of logs after periods of inactivity might have synergistic effects." This would imply that Alternatives 2 and 4 might have greater cumulative effects than Alternatives 3 and 5, since the former alternatives would transfer volume over various LTFs more frequently in the foreseeable future.

It is not known which areas may be scheduled for harvest during the 1995 to 2011 time period to fulfill contractual commitments to APC. The *Indirect and Cumulative Effects, Timber* section of Chapter 4 projects acres for harvest between 1995 and 2011 by VCU. It is assumed there would be a direct relationship between reuse of a former LTF and the amount of past impacts with future use of the same location and the anticipated amount of impact. This allows for a relative comparison between volumes scheduled for harvest by the alternatives, and allows comparison of past effects to present and future effects.

Because smaller amounts of volume are projected for transfer to saltwater during one or two entries over most of the previously existing LTFs, depending on the selected alternative, it is reasonable to assume that indirect and cumulative impacts would be less than those experienced during previous harvest cycles.

Long-Term Productivity

This section compares the short-term effects of developing LTFs in the intertidal area to long-term productivity of the area for having access to manage timber for commercial purposes. Without access to dump logs into saltwater, the long-term opportunity to manage the uplands for commercial timber production is lost.

The purpose and need for this Project is to provide timber volume to meet the Forest Service's commitment to provide timber volume to the APC Long-Term Timber Sale Contract. If for some reason LTFs were not approved by permitting agencies, the volume tributary to those facilities would no longer be available to meet contractual obligations. A comparison of LTFs to the Log Transfer Facility Siting, Operations, Construction and Monitoring/Reporting guidelines is included in Appendix I.

The purpose and need for this project is to provide enough timber to satisfy the APC long-term contract.

This section compares the affected area of the marine environment (short-term use) with the upland areas designated by the TLMP for multiple-use management (long-term productivity). It is assumed that other resources would have similar management opportunities with or without access to the uplands from saltwater by a LTF. Table 4-75 compares the number of acres potentially affected by each LTF to the acres of suitable timber tributary for each location. It also shows the range of volumes estimated to be transferred ovr each location for the present and foreseeable future. This range of volumes represents volumes from the current alternatives and the projections for the foreseeable future, rounded to the nearest million board foot (MMBF). The last column shows the estimated volumes scheduled by the TLMP to meet the allowable sale quantity over the rotation.

Estuarine System

Table 4-75
Comparison of Short-term Uses to Long-term Productivity for the Estuarine System

VCU	LTF Name	Acres Estimated Impact	Acres Tentatively Suitable	Range of Harvest 1991-2011 MMBF	TLMP Schedule Rotation MMBF
293	Appleton Cove	1.4	6,100[1]	26 - 39	99
296/297	Hanus Bay	1.4	14,200	68 - 85	247
314	South Arm	0.3	2,300	4 - 9	11
Total		3.1	22,600	98 - 133	357

SOURCE: Burns, 1991.

[1] Acres from VCU 293 only.

Short-term use of 3.1 acres of estuary habitat, all of which occurs in large estuaries, would provide access to 22,600 acres of land suitable for timber production. This roughly equates to between 98 MMBF to 133 MMBF to be available to meet commitments to the APC contract in the present and foreseeable future. For the long-term scenario, the TLMP scheduled roughly 357 MMBF over the rotation to meet the allowable sale quantity. Opportunity to manage this area for commercial forest products would be lost if permits for LTF construction cannot be obtained from State and Federal agencies.

Table 4-76 compares the number of acres potentially impacted by each LTF to the acres of suitable timber tributary for each location regarding the marine system.

Marine System

Table 4-76
Comparison of Short-term Uses to Long-term Productivity for the Marine System

LTF VCU	Estimated Name	Acres Tentatively Impact	Acres 1991-2011 Suitable	Range of Harvest Rotation MMBF	TLMP Schedule MMBF
292	Rodman Bay	1.5	11,400[1]	33 - 95	366
292/293	SE Rodman Bay	3.1	6,100[2]	12 - 39	99
294	West Saook	1.3	5,600	32 - 41	107
296/297	North Hanus Bay	1.4	14,200	68 - 85	247
298	Bourbon Creek	1.5	2,600	17 - 33	72
314	North Point	1.5	500	2 - 3	12
315	North Basin	<2.5	1,300	7 - 10	21
315	South Basin	<2.5	1,300	6 - 8	27
315	Cosmos Cove	<2.5	1,100	4 - 8	22
Total		<17.8	44,100	181 - 322	973

SOURCE: Bums, 1991.

[1] Includes suitable acres and estimated volumes from VCUs 291 and 292 which are outside of the Kelp Bay Project Area, but would be tributary to a LTF in Rodman Bay sometime in the foreseeable future.
[2] Acres from VCU 293 only. Acres from adjoining VCUs 292 and 291 are shown for Rodman Bay so the table would add up correctly.

Short-term use of less than 17.8 acres of marine system habitat out of roughly 7,700 acres of marine system habitat that occurs in the Kelp Bay Project Area represents 0.23 percent of the estimated available habitat and is considered very minor. The proposed LTFs at these locations would provide access to 44,100 acres of land suitable for timber production. This roughly translates to between 181 and 322 MMBF available to meet contractual obligations to APC in the present and foreseeable future. Based on projections made for the allowable sale quantity in TLMP, these LTFs would serve to transfer roughly 973 MMBF over the rotation. Inability to obtain LTF construction permits from State and Federal agencies would mean loss of opportunity to manage these areas for commercial forest products.

Rockfill or riprap, though it may cover the current habitat, also provides habitat for future colonization by species similar to those occurring (Forest Service 1986b). Through the years, either the rockfill or the regraded beach at each LTF location would be expected to recolonize with species similar to those currently occurring, thereby maintaining productivity of the marine habitat. The LTF site in South Basin (VCU 315) was investigated before LTF construction, and then after the LTF had been dismantled and the beach graded to approximate natural beach contours. Analysis showed that recolonization had occurred in 10 to 12 years since use, supporting this recolonization conclusion (Burns, 1991).

Land Status

Direct Effects

Special Uses

One recreational special-use permit for outfitting and guiding has been issued in the Kelp Bay Project Area during the past 2 years. The operator worked from a temporary camp on the western shore of Pond Island for 2 weeks during the late spring and 2 weeks in the early autumn. There would be no direct effects to this permittee from the Kelp Bay Project, since none of the alternatives proposes activity on Pond Island. There are no other special-use permits issued for the Project Area for either recreational or non-recreational activities.

Land Ownership

The Kelp Bay Project Area contains only national forest system lands. There is no private land or lands of other ownership within the boundary of the Project Area. There are, however, opportunities for claims by other entities that may result in changes in land ownership.

The Alaska Native Claims Settlement Act of 1971 (ANCSA) provided for conveyance of certain lands to Native Corporations. This process is not complete; however, all of the native selections have been made. All of the land in Township 51S., Range 66E. CRM (Copper River Meridian) on the northeast corner of Catherine Island has been selected by both Kootznoowoo Inc. and Sealaska Corporation. Although this selection has been made, the actual conveyance of these lands to the two corporations may or may not occur.

Under Alternative 1, there would be no activity resulting in direct effects to the selected lands. Alternatives 2, 3, 4, and 5 propose varying amounts of road construction and timber harvest within the selected area. The amount of activity proposed under each alternative is shown in Table 4-77. Timber harvest and road construction activities could proceed after consultation with the two affected Native Corporations, taking into consideration their concerns and desires.

Table 4-77
Timber Harvest Within the Area Selected by Native Corporations

	Alt 2		Alt 3		Alt 4		Alt 5	
Unit	Acres	MBF	Acres	MBF	Acres	MBF	Acres	MBF
420 *			< 5	< 125	< 5	< 125	< 5	< 125
421 *	< 5	< 65			< 5	< 65		
422 *	< 5	< 65	< 5	< 65	< 5	< 65	< 5	< 65
427	17	221			17	221	88	1144
428							35	455
429	25	325			25	325	25	325
431	14	350			14	350	14	350
432 *	< 5	< 125			< 5	< 125	< 5	< 125
438					17	425	88	2200
439	68	884			68	884	68	884
450 *					< 5	< 65		

Note: * Indicates that less than five acres of the Harvest Unit lies within the Selection Area.

Other Claims Or Withdrawals

There is one lighthouse withdrawal on Fairway Island, which lies off the northern shore of Catherine Island. There would be no direct effects to this withdrawal as none of the alternatives proposes activity on Fairway Island. Finally, there are no mining claims in the Kelp Bay Project Area.

Indirect Effects

Special Uses

The proposed actions would result in indirect effects to both existing and potential recreational special-use permittees. Operators working from temporary camps on the shores would probably attempt to locate in areas removed from activities involving road construction and timber harvest. Other operators may be completely displaced from the Project Area because of a desire to be out of view of all harvest-related activity.

Beginning in 1991, additional outfitters and guides may be authorized by Forest Service special-use permits for occasional use in the Kelp Bay Project Area. These operators and their clients may be indirectly affected by activity. These effects are discussed further in the *Recreation* section in this Chapter.

Predicting changes in the patterns of special-use permits for the reasonably foreseeable future is difficult. Sites under special-use permit status tend to be grouped in areas having some past activity or development, such as roads and landings accommodating access. But there are currently no special-use permits in the study area, some of which has been previously roaded and harvested.

Other Claims Or Withdrawals

There are no mining claims located in the Kelp Bay Project Area, and the area does not have high mineral potential. However, the construction of roads under the action alternatives may improve access to areas of mineral potential. The result may be mineral exploration or other investigation that otherwise might not have occurred if inexpensive, convenient access were not available.

Cultural

Overview

Cultural resource sites within the Kelp Bay Project Area may contain important information on past environmental conditions and lifestyles, including information related to environments and cultures along the northern Pacific Rim and possibly the interior of the North American continent. These sites are fragile and nonrenewable. Impacts can include alterations to the setting of sites; alterations of above-ground objects, features, and structures, as well as the spatial relationships among them; and disturbance of subsurface cultural deposits.

The Forest Service has determined that creating an inventory of cultural resources for all of the Kelp Bay Project Area alternatives would be costly and impractical. As a result, in consultation with the State Historic Preservation Officer (SHPO), the Forest Service is developing a Research Design that will be applied to the selected alternative. This Research Design will provide a planned outline for conducting complete archaeological surveys in certain prescribed areas of the Kelp Bay Project Area. The Research Design is being prepared by the Chatham Area Archaeologists for the Kelp Bay Project Area.

A complete survey consists of a systematic walk over of an area, including shovel tests dug at a previously determined intervals. A variety of characteristics have been considered and weighed in designing where the surveys will be conducted, such as known previous land-use patterns, isostasy (rebounding of the earth's crust) and eustacy (changes in sea level), degree of slope, elevation, and areas identified as muskegs. The information has been generated on the Geographical Information System (GIS) and a series of overlays produced from which the analysis is being conducted to identify the areas to be surveyed.

In the current model being tested for the Kelp Bay Project Area, the criteria for slope and elevation have been slightly adjusted from the Regional standards as outlined in Title 2300 of the Forest Service Manual. The Regional standard for high, medium, and low cultural probability zone as outlined in the manual can be seen in Table 4-78.

The elevation has been adjusted from 100 feet up to 150 feet in order to evaluate the significance of the 100-foot division. Another change which has been included in the current Research Design is a change of slope from 30 to 35 percent. The reason for this change was partially due to the GIS process; most of the landform information was entered based on the slope break at 35 percent. As a matter of convenience, this slope percentage has been carried over into the Kelp Bay Project Research Design.

Table 4-78
Cultural Probability Zones

Probability Zone	F.S. Manual 2300's	Kelp Bay Project Area
High	Sea level to 100 foot elevations	Sea level to 150 foot elevations
Medium	100-1000' with slopes <30%	150-300' with slopes <35%
Low	100-1000' with slopes >30% and all elevations >1000	All elevations >300'

SOURCE: Swanson-Iwamoto, 1991

Table 4-79 has been generated based on the 0- to 150-foot and 150- to 300-foot elevation scheme and slope breaks at 35 percent. As discussed above, other criteria are being applied in the Research Design which will determine exactly which units and roads are to be surveyed for the Kelp Bay Project Area. It should be noted that the cutting units and road miles listed below are therefore not necessarily final. This table shows an absolute minimum number of cutting units and road miles which will need to be surveyed by each alternative for the Kelp Bay Project Area.

Upon completion of these surveys, all sites identified will be analyzed. In accordance with 36 CFR Part 60, the criteria for evaluation for the significance of a property for listing on the National Register of Historical Places will be applied for those properties found eligible and the Determination of Effect will be made as directed in 36 CFR Part 800. Mitigative measures will be outlined in the Determinations of Effect with avoidance being the preferred mitigation plan. All of this work will be completed prior to the beginning of the timber harvesting and any associated activities.

Table 4-79

The Number of Units and Miles of Road That Will Be Surveyed by Alternative

VCU		Alt. 2	Alt. 3	Alt. 4	Alt. 5
293					
	Harvest Units	1	2	0	4
	New Roads	1.0	1.0	0.0	1.3
	Existing Roads	3.6	3.6	3.6	3.6
294					
	Harvest Units	2	3	3	3
	New Roads	1.9	1.9	1.9	1.9
	Existing Roads	2.5	2.5	2.5	2.5
296					
	Harvest Units	2	0	0	2
	New Roads	1.3	0.0	0.0	1.4
	Existing Roads	3.6	3.6	3.6	3.6
297					
	Harvest Units	1	0	1	1
	New Roads	0.8	0.0	0.8	0.8
	Existing Roads	5.9	5.9	5.9	5.9
298					
	Harvest Units	3	0	0	4
	New Roads	0.0	0.0	0.0	0.6
	Existing Roads	2.4	2.4	2.4	2.4
314					
	Harvest Units	0	0	0	6
	New Roads	0.0	0.0	0.0	2.2
	Existing Roads	0.1	0.0	0.1	0.1
315					
	Harvest Units	4	0	1	5
	New Roads	3.9	0.0	1.1	3.7
	Existing Roads	2.3	0.0	2.3	2.3

SOURCE: Swanson-Iwamoto, 1991.

Direct and Indirect Effects

Alternative 1, the No-action Alternative, would result in no further effects on cultural resources from APC long-term timber sale activities. In addition to avoiding site disturbance or distraction, the No-action Alternative would decrease the likelihood that beneficial effects would result from scientific study, interpretation, and appreciation of cultural resources.

The various action alternatives under consideration for the Kelp Bay Project Area are generally not expected to differ in their impacts on cultural resources. Before logging activities are undertaken in the selected alternative, Forest Service cultural resource specialists will apply the Research Design to inventory and identify currently undiscovered cultural resources, evaluate their significance, determine potential project impacts, and design and implement necessary mitigation measures. Such measures could include relocating or redesigning some timber management activities to avoid disturbing cultural resources, protecting sites through the use of barriers, and recovering scientific data or otherwise documenting sites that cannot be avoided or protected. Mitigation measures would be designed to eliminate adverse project effects on significant cultural resources and would be set into enforceable contract provisions.

Cultural resources are considered unique as they are a non-renewable resource and have therefore encountered a unique aspect in the contractual agreement between APC and the Forest Service. As stated in Section 7n of the contract, *Protection of Cultural Resources* (pages 31-32), the contract might be modified by the Forest Service to protect cultural resources which may be discovered during the course of the Purchaser's (APC) operations. In the event that any cultural resource is identified, both parties shall be notified immediately. The Purchaser shall protect all cultural resources against destruction, obliteration, removal, or damage during the operating period.

Cumulative Effects

Impacts from natural decay, landscape changes, private developments, and timber management activities have combined to disturb a portion of the cultural resources of Southeast Alaska. Development activities of all kinds pose particular threats to cultural resources because such activities tend to be located in the same places that cultural resources are found, such as sheltered coastal settings.

It is impossible to determine the exact nature and number of resources that have been disturbed in the Kelp Bay Project Area. Mitigation measures have only been implemented during recent years. Future timber management activities could combine with natural events to result in continued disturbance of cultural resources. The implementation of various mitigation measures would reduce this disturbance by preserving significant sites and providing data on those sites that cannot be preserved.

Economic and Social

Overview

A primary reason for selling timber from the Tongass National Forest is to provide for economic development and community stability. The objectives for timber harvest result from specific guidelines furnished through legislation and historic direction related to employment, price stability, economic efficiency, foreign relations, small business economic growth and development, community stability, and national security.

Since 1980, the Alaska National Interest Conservation Act (ANILCA) and the TLMP have furnished the direction for timber harvest. Section 101(d) of the Alaska National Interest Conservation Act states the intent of Congress:

Southeast Alaska is home to a diverse mixture of traditional and modern cultures.

This Act provides sufficient protection for the national interest in scenic, natural, cultural, and environmental values on the public lands in Alaska, and at the same time provides adequate opportunity for satisfaction of the economic and social needs of the State of Alaska and its people; accordingly, the designation and disposition of the public lands in Alaska pursuant to this Act are found to represent a proper balance between the preservation of national conservation system units and those public lands necessary and appropriate for more intensive use and disposition, and thus Congress believes that the need for future legislation designating new conservation system units, new national conservation areas, has been obviated thereby.

The passage of the Tongass Timber Reform Act in November of 1990 modified sections of the Alaska National Interest Conservation Act, but did not dispute the benefits of economic development and community stability from the harvest of the timber resource. These economic and community effects are key components of the analysis of the environmental consequences of the proposed actions and the other alternatives considered. This section of Chapter 4 presents the direct, indirect, and cumulative effects of implementing the various alternatives on the economic and social environment of the Kelp Bay Project Area.

The area influenced by the proposed actions in the Kelp Bay Project Area includes communities in proximity to the Project Area (Angoon); communities with production facilities that use the timber harvested (Sitka and Wrangell); and communities whose residents visit the Project Area to hunt, fish, or pursue various recreational activities. As a group, these communities form a large part of what is referred to as Southeast Alaska. In general, employment, personal earnings, and the well-being of the population in the individual communities follow the economic activity in Southeast Alaska as a whole. As a result, the following analysis must encompass the entire area of influence for the Project Area, which for the most part includes all of Southeast Alaska. Where possible, specific ties to the Kelp Bay Project Area are made.

Direct and Indirect Effects

Direct effects are those effects caused by the proposed actions and which occur at the same time and place as the actions themselves. Effects which are caused by the proposed actions but which occur later in time, or at a place away from the actions, are considered indirect effects. Although these effects are analyzed separately, both direct and indirect effects are equally important in the evaluation of the alternatives. The actions proposed in the Kelp Bay Project Area will primarily affect the economic and social environment outside the Project Area. As a result, for the purposes of this analysis, the economic and social effects are not considered direct effects.

Although the proposed actions predominantly affect communities and people located outside of the Project Area, there will be some effect on the people who will reside in the logging camps that will be established within the Project Area. These temporary communities will not only be affected by the proposed actions, they will be an integral component of the actions. The analysis of the effects of the proposed actions will consider the effects on the people of the logging camps as if they lived in the surrounding communities and commuted to their work within the project area. This assumption should not cause any effect to be missed or minimized.

Employment and Income

This section addresses the employment and income benefits that would be derived from the harvest of timber on the Tongass National Forest, under provision of the action alternatives considered for the Kelp Bay Project Area in this Draft EIS. The volume of timber harvested in each alternative (and to some extent the location of the harvest and the standards and guidelines applied) has the potential to affect the number of jobs available throughout a large portion of Southeast Alaska. In estimating job impacts, it is assumed that other supply and demand factors affecting markets for national forest products and uses remain constant. This assumption becomes more tenuous the further out in time that projections of effects are made. For example, the amount of timber offered in the Kelp Bay Project Area or for sale on the Tongass National Forest as a whole is not, and will be never, the only factor that affects the number of timber industry jobs. Worker productivity, interest rates, import and export levels, production and shipping costs, regional competition, private and public land harvest levels and policies, and other factors all affect the supply of and demand for timber and the resulting number of jobs. Therefore, this analysis focuses on the comparison of potential changes in the number of jobs over the 5-year operating period for each alternative relative to a current base level.

Ship ready to load cedar logs for export to Pacific Rim countries. Export demand and shipping costs play a large role in determining employment and income potential in Southeast Alaska.

The number of jobs associated with each alternative was estimated based on assumptions and models developed and used previously by the Forest Service for planning on the Tongass National Forest. These estimates are a function of changes in final demand resulting from changes in output levels. Changes in output or activity levels initiate expenditures in various sectors of the local economy which trigger the change in jobs (and income). In the Tongass National Forest, job and income effects are based on changes in the amount of timber volume harvested; changes in recreational use and tourism, including hunting and fishing; and changes in commercial fishing.

Timber Industry

Based on a timber supply and demand report for Southeast Alaska (Forest Service, 1989), and estimates derived from a computerized model called the Interactive Policy Analysis Simulation System (IPASS) (Olson et al., 1984), the Forest Service has calculated the average direct and indirect employment related to harvest volume from the Tongass National Forest and the value of each job (logging, sawmill, and pulpmill). The estimates of future timber-related employment for the Kelp Bay Project Area were based on 8.64 jobs per million board feet per year for both direct and indirect employment. Timber- related employment is derived simply by multiplying 8.64 by the total timber harvest which is calculated for each alternative. This explains why national forest timber-related jobs vary by alternative while other resource sector jobs remain constant.

The estimates of future personal income were based on an average value of $23,200 for each job maintained by the proposed actions. Personal income is derived by multiplying the number of jobs provided by each alternative by the average worth of $23,200.

Table 4-80 displays the estimated timber volume harvested for each alternative and the number of jobs provided both directly and indirectly by the timber industry as a result of that level of harvest. The table also displays the estimated personal income (salaries) that would result from the jobs.

Alternatives 2 through 5 provide sufficient timber volume to maintain current mill operations. The total volume harvested ranges from 86 MMBF in Alternative 4 to 230 MMBF in Alternative 5. These volumes would be provided to APC in annual offerings that would maintain the required available volume. As a result, the annual harvest and annual mill production for each of these alternatives would be expected to remain relatively constant, and would not have a significant effect on the timber industry or its dependent employment and income.

Alternative 1, which provides no jobs, results in a loss of employment in the affected communities. This loss of jobs associated with Alternative 1 would be between 587 and 1,570. Given the assumption of stable mill operations, it is estimated that approximately 860 jobs would be lost.

Table 4-80
Timber Industry Employment and Income for Each Alternative

	Alternatives 1	2	3	4	5
Total Volume Harvested (MMBF)	0	136	121	86	230
Employment (Jobs)	0	928	826	587	1,570
Personal Income (Million$)	0	21.5	19.2	13.6	36.4

SOURCE: Thomas, 1991.
Note: Employment is based on 8.64 jobs per MMBF of sawlog volume and Personal Income (total value of wages) is based on $ 23,200 per job. Sawlog volume is estimated to be 79 percent of total volume harvested.

Alternative 1 would result in the inability to provide a sufficient volume of timber to maintain the contractually required operating supply for APC. In addition, this volume could not be provided from other areas within an acceptable timeframe. The timber supply would likely decline by about 100 MMBF in the APC contract sale area. This could result in mill closures in Sitka and Wrangell and would result in a reduction of an estimated 860 jobs in the affected communities. This would have a triple effect throughout the various economic sectors in Southeast Alaska that both directly and indirectly benefit from the employment with APC. This loss of direct and indirect employment in the timber industry would be expected to result in slower (possibly negative) population growth and other adverse social effects in some communities. These consequences of Alternative 1 are expected to produce a significant effect on the timber industry and the economic and social environment dependent on that industry.

Commercial Fishing Industry

As mentioned in the *Fish and Water* section earlier in this chapter, potential impacts on fishery resources are minimal because of the site-specific standards and guidelines being applied along fish streams and the relatively small amount of fish habitat adjacent to harvest units. Because of this, none of the alternatives is expected to have any affect on income or employment opportunities in the sport or commercial fishing industries or any related economic sectors.

Recreation and Tourism Industry

Future employment in the recreation and tourism industries, including employment related to sport hunting and fishing, is projected to change at the same rate as future use. The projected use is expected to increase 27 percent for recreation and tourism, 36 percent for sport fishing, and 53 for hunting-related jobs during the 1990s (Forest Service, 1990a). Consequently, total recreation and tourism related jobs in Southeast Alaska are estimated to increase in a similar manner. This change is not due to or affected by the proposed actions in the Kelp Bay Project Area.

Jobs and earnings related to expenditures made by deer hunters and salmon anglers are widely dispersed across Southeast Alaska. Hunters and anglers using the affected area replenish their groceries and gasoline and take some meals in nearby communities, but most of their expenditures for equipment and initial supplies are made in their home community. Similarly, the employment and personal income generated by other people who use the Kelp Bay Project Area for recreation are dispersed across Southeast Alaska and throughout a variety of economic sectors. These people include individual recreationists, outfitters-guides and their clients, and tourists viewing the Project Area from cruise boats or the Alaska Marine Highway ferry system.

Because relatively little recreational activity takes place in Kelp Bay Project Area, and because the alternatives would have very little effect on the actual recreation places, no significant impact is expected on employment and income opportunities in the recreation and tourism industry. The expected effect of the various alternatives would be to displace the recreational use to areas outside of the Project Area. This displacement would be a result of recreationists seeking specific primitive or semiprimitive recreational opportunities that might no longer be available in the area of active timber harvest or road construction. This displacement would not result in any significant change in employment or income.

Commercial recreational activity in the Kelp Bay Project Area includes guided brown bear and deer hunting, and both freshwater and saltwater fishing. Brown bear habitat carrying capacity is not expected to be reduced significantly; however, deer habitat carrying capacity will be lowered by proposed harvest in the Kelp Bay Project Area (effects on habitat carrying capacity are fully discussed in the *Wildlife* section of this chapter). Outfitters predominantly guide brown bear hunters, and to a much lesser extent deer hunters; thus, only limited effects to this form of commercial use would result. The activity associated with timber harvest and road construction, and the lasting effect of the developments, has the potential to displace outfitters. When an outfitter goes out of business, a negative impact results. Displacement of outfitter activities, however, does not denote negative impacts to the analysis area. Although the alternative may result in some outfitters being displaced, none are expected to go out of business as a result of activities proposed through 1995. Therefore, significant impacts to recreational employment are not expected of the action alternatives.

Receipts and Payments

Dollar payments to the State of Alaska are based on the 25 percent formula for uses of the Tongass National Forest land and resources that generate income for the Federal government. Ninety-nine percent of the payments to the State from Federal receipts are generated from timber sales. Money returned to the State is earmarked for use on public schools and roads. When monetary receipts drop, the State must generate revenue through other sources to maintain the same quality and quantity of school and road programs. This, in turn, may decrease the money available for other programs.

Although it is desirable to display the estimated payments to the State of Alaska by alternative, the Forest Service is unable to determine at this time the actual gross revenue from timber sales in the Kelp Bay Project Area. However, it is known that the variation in the total revenue by alternative is almost directly related to the amount of timber harvested. Those alternatives which have the highest proposed timber harvest also have the highest potential revenues. Alternative 5 would generate the largest amount of revenue due to its proposed harvest of an estimated 230 MMBF. This alternative would, as a result, have the highest level of payment to the State. Alternatives 2 and 3 would have the next highest revenues followed by Alternative 4; and Alternative 1 would generate no revenue and as a result no payments to the State of Alaska.

Population

Net population change in Southeast Alaska is most directly influenced by economic opportunity. Such variables as currency exchange rates; foreign demand for natural resources; interest rates; and the availability of alternative, cost-competitive sources of supply often have much greater influence on the economy of Southeast Alaska than national forest management. It is anticipated, however, that employment associated with goods and services provided by the Tongass National Forest will induce some employment-related population changes. Relative to some other regions of the State, Southeast Alaska's population has remained fairly stable. Those population fluctuations that have occurred are frequently associated with boom-and-bust cycles of the economy.

Many communities have a history of moderate boom-and-bust population cycles associated with expansion and contraction of the local economy. They have had experience adapting to these cycles, and they have often institutionalized into their social structures the capacity to adapt to these swings in population. It is not anticipated that population changes induced by timber management activities in the Kelp Bay Project Area will be pronounced enough to seriously strain the capacity of local institutions (e.g., local government, school systems, medical services, etc.). This is a result of the fact that the four action alternatives are designed to maintain, to some degree, the existing level of timber harvest in the APC contract area.

The selection of the No-action Alternative for the Kelp Bay Project Area would result in the inability of the Forest Service to meet the contractual requirements for the APC long-term timber sale. This might result in a slowdown or shutdown of the pulp mill in Sitka and the sawmill in Wrangell. This alternative could also result in a loss of work for the independent timber harvest and road construction companies working for APC. This would, of course, have a ripple effect throughout the various economic sectors in Southeast Alaska that indirectly benefit from the employment with APC.

This loss of direct and indirect employment in the timber industry would be expected to result in slower (possibly negative) population growth in some communities as timber-related employment declines in relation to declining timber harvest within the APC contract area.

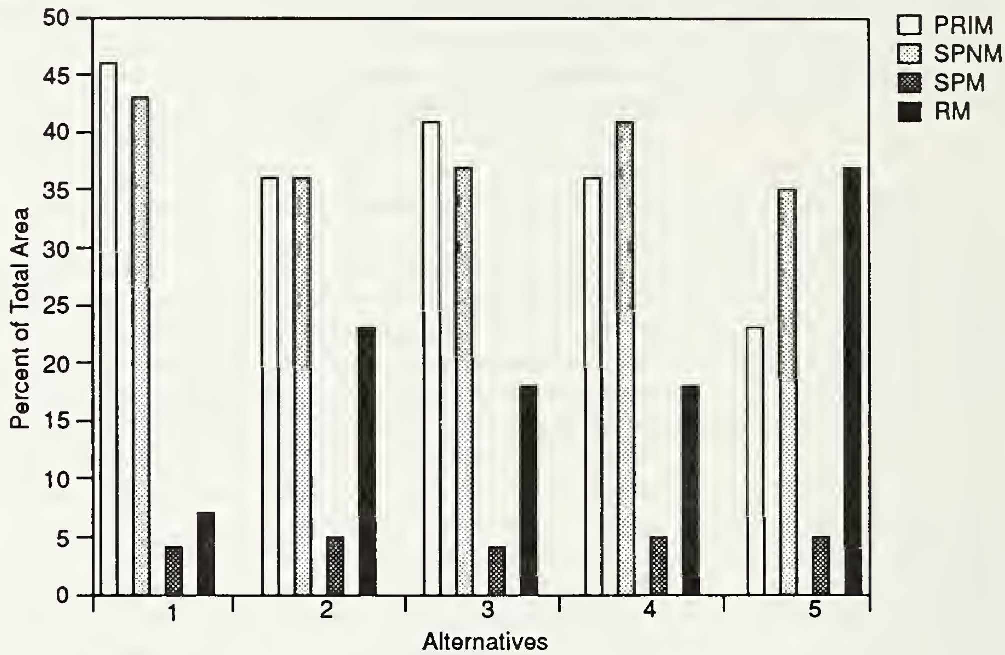
Lifestyles

In addition to changes in employment opportunities, income, and population, implementation of different alternatives will have differential effects on other elements of community lifestyles. Most immediately, community recreation and subsistence patterns could be affected by habitat modification, enhanced or restricted access, and competition from outsiders.

In terms of recreation opportunities, Figure 4-25 displays the percent of the total acreage of the Kelp Bay Project Area allocated to primitive, semi-primitive, and roaded modified recreation. Alternatives 1 and 3 allocate the greatest amount of land to primitive recreation while Alternative 5 provides the least. Alternatives 1 and 4 provide greater opportunity for semi-primitive motorized and non-motorized recreation experiences; however, all five alternatives provide relatively similar levels (40-47 percent) of this experience. Roaded modified recreation opportunities are projected to occur with greatest abundance under Alternative 5, and least available under Alternative 1.

Figure4-25

Recreational Opportunity Spectrum Class--Percent of Total Area



SOURCE: Nelson, 1991.

NOTE: PRIM represents Primitive, SPNM represents Semi-Primitive Non-Motorized, SPM represents Semi-Primitive Motorized, and RM represents Roaded Modified.

Important elements that ensure the continuation of subsistence harvest include access, the lack of competition, and an abundance of fish, wildlife, and plants. Due to the potential harvest of resources by non-rural and rural residents outside of their home ranges, and due to the possible reduction and redistribution of wildlife populations resulting from implementation of alternatives, the possibility of a significant restriction of subsistence use of wildlife resources exists for some communities under all alternatives. This issue is discussed in greater detail in this Chapter under *Subsistence*..

An additional lifestyle consideration of community residents involves aesthetic ties to adjacent national forest lands. As the public involvement analysis indicates, even individuals residing in communities dependent on the wood product industry often evidenced support for scenic quality, developed and dispersed recreation, maintenance of nearby old-growth habitat, prohibitions on roading, and greater emphasis on wildlife habitat. Alternatives that provide for the most acres of intensive timber harvest in the Project Area (Alternatives 5 and 2) have the potential to affect these aesthetic ties to the greatest degree. Alternatives 1 and 4, which emphasize non-timber resources and provide the least timber harvest, will provide for the maintenance of aesthetic and amenity values that are dependent on a relatively natural or undeveloped forest setting.

Community Stability

Community stability is a very important consideration in planning for timber harvest activities in the Tongass National Forest. In addition to the values described in the preceding discussions (employment, income, payments, population, and lifestyles), a balance between natural and human resource activities is important to the communities of Southeast Alaska. Many of the residents of Southeast Alaska derive their livelihood from the timber industry or benefit from the economic development the timber industry has brought to their communities. Many residents also participate in a wide variety of activities dependent on the national forest, and/or reside in Southeast Alaska because of the natural setting. As a result, a balance between economic development and an emphasis on non-commodity resources is a desirable objective.

Alternative 1, with its emphasis on non-commodity resources, may result in the inability of the Forest Service to meet its contractual obligations to APC. Furthermore, it may result in a substantial cutback in APC production. This will have a significant negative effect on community stability. Alternative 5, on the other hand, would place a large portion of the Kelp Bay Project Area under intensive management. This may have a substantial negative effect on the people that use the area for recreation, subsistence, and other activities that require a more natural setting. Alternatives 2, 3, and 4 strike a balance between intensive timber management and non-commodity uses and therefore have the least potential to impact community stability.

Cumulative Effects

The cumulative effects of each of the alternatives on the economic and social environment are quite difficult to estimate. There are a wide variety of factors affecting the employment, income, receipts, population, lifestyle, and community stability of Southeast Alaska. It is not easy to project the incremental effect of the proposed actions in the Kelp Bay Project Area on the past, present, and reasonably foreseeable future actions in the APC contract area. There are two aspects of a long-term timber harvest in the APC contract area, specifically in the Kelp Bay Project Area, that need to be addressed.

The first aspect relates to the economic and social benefit of continuing to meet the contractual requirements of the APC Long-term timber sale contract and offering adequate timber volume to meet the timber demands in order to maintain APC operations at a stable level. From the standpoint of employment, personal income, population, community services, and community stability, there is substantial benefit from maintaining long-term timber harvest in the contract area. The receipts generated, including revenue to the U.S. Treasury, payments to the State ofAlaska, state and local taxes, and dollars brought into the community, all represent an economic benefit of continued timber activity. The Kelp Bay Project Area is one component. The decision was made in the TLMP to allocate this area for long-term timber harvest; as such, the Kelp Bay Project plays a role in providing these economic and social benefits.

The second aspect of a long-term timber harvest that needs to be addressed is the alteration of the natural environment that takes place when roads are constructed and timber is harvested. As stated earlier, much of the economic and social value of Southeast Alaska is dependent on its natural setting. The recreation and tourism industry is based primarily on the natural conditions and visual resources. As more and more acres of national forest and other land are converted from a natural condition to a managed forest, the activities dependent on, and the values attributed to, the natural state of the forested land will be adversely affected. One example is the recreational use that occurs in a primitive or semi-primitive setting. This type of use may be displaced by the timber activities in the Kelp Bay Project Area, and will ultimately be restricted to those areas where timber management is not a part of the management prescription.

The balance necessary to maintain a viable or even robust economic and social environment must be set at a national forest level, not at a project level. The cumulative effects on the economics and community values of the proposed actions for the Kelp Bay Project, or for that matter any local project, will be relatively small compared to the effects of other factors. It is important to recognize both the effects of the proposed actions and the incremental nature of the effects.

Subsistence

ANILCA Section 810 Subsistence Evaluation

Section 810 of the Alaska National Interest Lands Conservation Act (ANILCA) requires a Federal agency having jurisdiction over lands in Alaska to evaluate the potential effects of proposed land-use activities on subsistence uses and needs. Section 810 of ANILCA states:

In determining whether to withdraw, reserve, lease, or otherwise permit the use, occupancy, or disposition of public lands under any provision of law authorizing such actions, the head of the agency having primary disposition over such lands or his designee shall evaluate the effects of such use, occupancy, or disposition on subsistence uses and needs, the availability of other lands for purposes sought to be achieved, and other alternatives which would reduce or eliminate the use, occupancy, or disposition of public lands needed for subsistence purposes. No such withdrawal, reservation, lease, permit, or other use, occupancy or disposition of such lands which would significantly restrict subsistence uses shall be effected until the head of such federal agency:

1. gives notice to the appropriate state agency and appropriate local committees and regional councils established pursuant to ANILCA Section 805;

2. gives notice of, and holds, a hearing in the vicinity of the area involved; and

3. determines that (A) such a significant restriction of subsistence uses is necessary, and consistent with sound management principles for the utilization of the public lands; (B) the proposed activity will involve the minimal amount of public lands necessary to accomplish the purposes of such use, occupancy, or other disposition; and (C) reasonable steps will be taken to minimize adverse impacts upon subsistence uses and resources resulting from such action.

Chapter 3 addressed current and historical subsistence uses on the Kelp Bay Project Area by the rural communities of Angoon, Kake, Klukwan, Meyers Chuck, Pelican, Petersburg, Port Alexander, Port Protection, Sitka, Tenakee Springs, and Wrangell.

This section evaluates how the proposed action alternatives could affect subsistence resources used by the above communities in the Kelp Bay Project Area. The subsistence resource categories evaluated are wildlife, fish, other foods (such as berries and kelp), and timber. Criteria used to evaluate the effects of the proposed alternatives are: (1) changes in abundance or distribution of subsistence resources, (2) changes in access to subsistence resources, and (3) changes in competition from non-subsistence users for those resources. The evaluation determines whether subsistence uses in the Project Area or portions of the Project Area may be significantly restricted by any of the proposed action alternatives. To determine this, the evaluation (1) considers the availability of subsistence resources in the surrounding areas; (2) considers the cumulative impacts of past and foreseeable future activities on subsistence users and resources; (3) looks at potential cultural and socioeconomic implications affecting subsistence users; and (4) focuses on the mapped subsistence use area in the Project Area.

The evaluation relies heavily upon the use of wildlife habitat capability models as well as upon ADF&G hunter survey data. (See Appendix G, for the habitat capability models used.)

This subsistence evaluation considers, with distinct findings by alternative and by resource category, whether or not there is a significant possibility of a significant restriction of subsistence use. The Alaska Land Use Council's definition of "significantly restrict subsistence use" is one guideline used in the findings. By this definition:

> A proposed action shall be considered to significantly restrict subsistence uses, if after any modification warranted by consideration of alternatives, conditions, or stipulations, it can be expected to result in a substantial reduction in the opportunity to continue subsistence uses of renewable resources. Reductions in the opportunity to continue subsistence uses generally are caused by: reductions in abundance of, or major redistribution of resources; substantial interference with access; or major increases in the use of those resources by non-rural residents. The responsible line officer must be sensitive to localized, individual restrictions created by any action and make his/her decision after a reasonable analysis of the information available.

The U.S. District Court Decision of Record in *Kunaknana v. Watt* provided additional definitions of "significant restriction of subsistence uses" and are also used as guidelines in the findings. The definitions from *Kunaknana v. Watt* include:

> Significant restrictions are differentiated from insignificant restrictions by a process assessing whether the action undertaken shall have no or slight effect as opposed to large or substantial effects. In further explanation the Director (BLM) states that no significant restriction results when there would be "no or slight" reduction in the abundance of harvestable resources and no occasional redistribution of these resources. There would be no effect (slight inconvenience) on the ability of harvesters to reach and use active subsistence harvesting site; and there would be no substantial increase in competition for harvestable resources (that is, no substantial increase in hunting by non-rural residents).
>
> Conversely, restrictions for subsistence uses would be significant if there were large reductions in abundance or major redistribution of these resources, substantial interference with harvestable access to active subsistence-use sites or major increases in . . . non-rural resident hunting.

In light of this definition, the finding of significant restriction must be made on a reasonable basis, since it must be decided in light of the total subsistence lands and resources that are available to individuals in surrounding areas living a subsistence lifestyle. The Draft EIS evaluates the availability of subsistence resources in surrounding areas that could be accessed without undue risk or economic hardship to subsistence users.

Direct and Indirect Effects to Wildlife

Specific areas within the Kelp Bay Project Area are more important for harvesting subsistence resources (Figure 4-26). Some proposed timber harvest units are within mapped subsistence use areas. Table 4-81 lists the harvest units by alternative. The locations of the proposed units, found on the alternative maps, are considered in the evaluation and the findings.

Timber Harvest Effects

Due to the number of proposed timber harvest units located within the mapped subsistence-use area (Table 4-82), the Draft EIS evaluates the use of other available lands. Chapter 1 and Appendix A address the availability of other lands within the APC contract area suitable for the proposed action. Within the Project Area, other areas are theoretically available for timber harvest; however, the extent (22,520 acres) and location of the Subsistence-Use Area precludes complete avoidance. Other areas that could be harvested are also within the Subsistence-Use Area, potentially adversely affecting other resource values such as soil and water protection or high value wildlife habitat; are uneconomical to harvest at this time; or conflict with Project Area unit and road design criteria (Appendix C).

Table 4-81
Proposed Timber Harvest Units in Subsistence Use Areas

Alternative 2 Unit Number/Acres		Alternative 3 UnitNumber/Acres		Alternative 4 Unit Number/Acres		Alternaative 5 Unit Number/Acres	
VCU293	VCU296	VCU293	222-69	VCU293	VCU296	VCU293	VCU294
128-72	307-3	128-72	223-1	128-72	320-*	102-6	210-*
131-36	331-*	131-36		131-36	334-*	128-72	221-69
132-13	340-*	132-13	VCU296	132-13	340-*	131-36	222-4
134-33	341-54	133-22	315-16	140-11	341-54	132-13	
138-*	345-*	140-11	317-22	141-7	500-17	133-22	VCU296
140-11	360=13	141-7	320-*	143-14		134-33	307-3
141-7	500-17	143-14	340-*	150-47	VCU297	136-2	315-16
143-14		144-16	341-54	151-19	401-31	140-12	316-30
144-16	VCU297	149-25	360-13	153-60	402-49	141-7	317-22
150-47	401-31	150-47	500-17	154-24	408*	143-14	320-*
151-19	402-49	151-19		157-7	419-35	144-16	
153-60	403-32	153-60	VCU297	158-16	420-82	149-25	VCU297
154-24	408-*	154-24	315-16		427-88	150-47	315-16
157-7	419-35	157-7	317-2	VCU294	429-25	151-19	316-3
158-16	425-4	158-16	400-63	209-*	431-14	152-38	317-2
	427-88		401-31	210-*	432-20	153-60	400-63
VCU294	429-25	VCU294	402-49	222-4	438-88	154-24	401-31
209-*	431-14	210-*	403-32	223-1	439-68	157-7	402-49
210-*	432-19	221-69	408-*		449-30	158-16	403-32
					450-75		

Table 4-81 (Continued)
Proposed Timber Harvest Units in Subsistence Use Areas

Alternative 2 Unit Number/Acres		Alternative 3 UnitNumber/Acres	Alternative 4 Unit Number/Acres	Alternaative 5 Unit Number/Acres	
VCU297	VCU-315	VCU297	VCU298	VCU297	508-1
(cont.)	500-2	(cont.)	340-1	(cont.)	512-14
437-28	700-8	416-29	341-5	408-*	515-*
439-69	701-8	419-35	500-33	416-29	516-*
440-91	702-1	420-82	504-*	419-35	
441-88	710-20	425-4	508-1	420-82	VCU314
442-56	711-34	434-44		425-4	600-40
443-32	714-52	449-30	VCU315	427-88	601-17
445-31	721-19		500-2	428-35	619-1
449-30	724-15	VCU298	710-20	429-25	637-*
	732-40	340-1	711-34	431-14	638-2
VCU298		341-5	713-26	432-19	
340-1		500-33	714-52	434-44	VCU315
341-5			720-36	436-29	600-6
500-33			721-19	437-28	700-8
504-15			724-15	438-88	701-8
506-3			732-40	439-68	702-1
507-01				440-91	709-55
508-1				448-23	710-20
				449-30	711-34
				451-22	713-26
					714-52
				VCU298	715-30
				504-*	720-36
				506-3	721-19
				507-*	724-15
					732-40

SOURCE: Edenshaw, 1991.
* Indicates overlap of less than 1 acre.

Figure 4-26
Subsistence Use Area Map

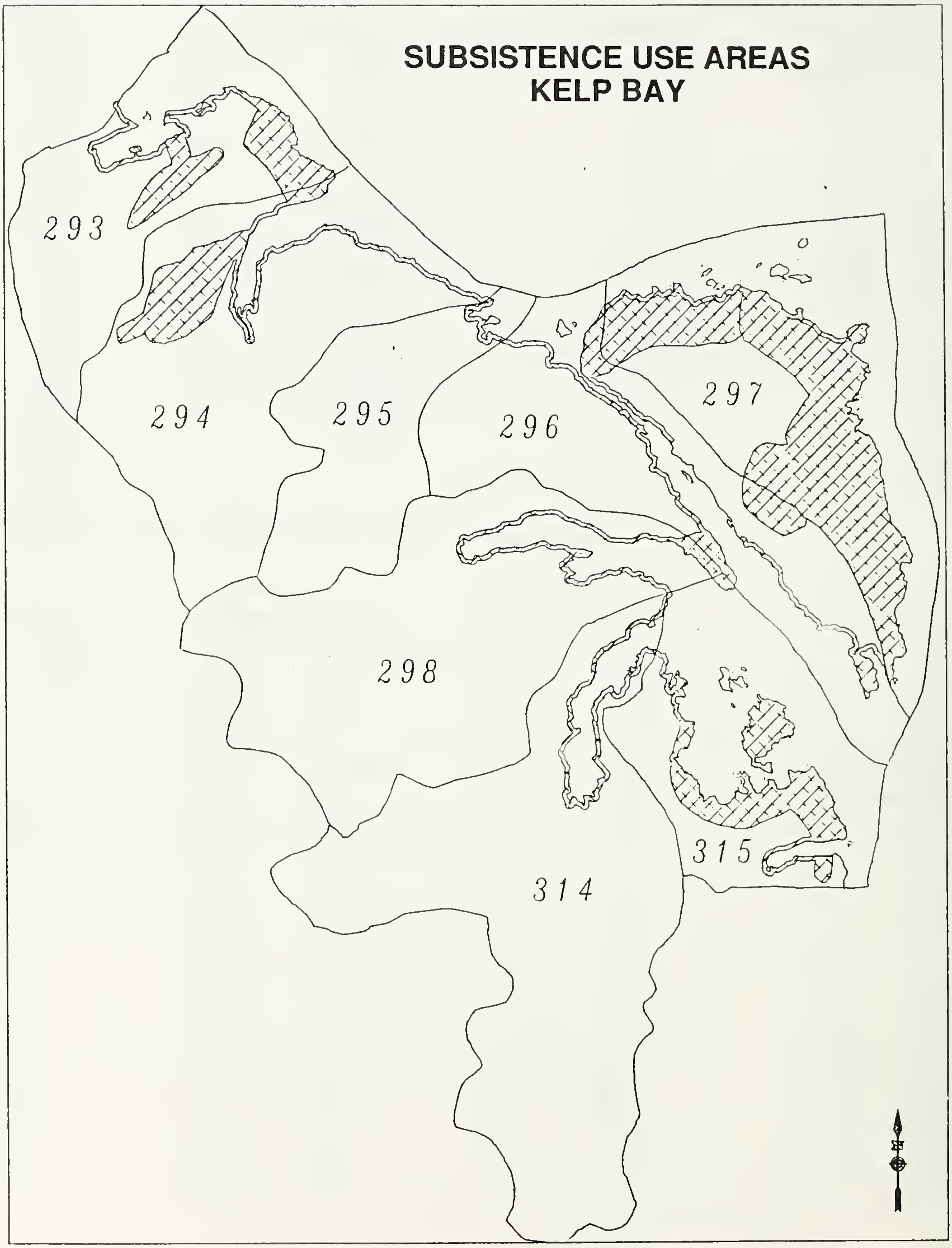


Table 4-82
Acres Proposed for Harvest Within Subsistence Use Areas

VCU	Alt.1	Alt. 2	Alt. 3	Alt. 4	Alt. 5
293	0	375	389	330	469
294	0	1	74	6	73
295	0	0	0	0	0
296	0	88	122	72	71
297	0	722	417	605	949
298	0	43	39	40	19
314	0	0	0	244	60
315	0	199	0	0	350
Total	0	1,428	1,041	1,297	1,991
Percent		6%	4%	5%	9%

SOURCE: Edenshaw, 1991.
Note: Total acres within the subsistence use area is 22,520.

Abundance and Distribution

Deer
Deer are an important subsistence resource used by the rural communities in the vicinity of the Kelp Bay Project Area. Chapter 3, *Wildlife* section, estimates that deer in Wildlife Analysis Areas (WAAs) 3313, 3315, and 3731 (Table 3-12), are currently being harvested at levels greater than the current population can sustain. In fact, the 1989 deer harvest level in all three WAAs was greater than what the estimated population could have sustained prior to any timber harvest. This assumes, as was pointed out in Chapter 3, that habitat capability projections from the deer model reflect an approximation of deer population. Furthermore, it is based on the determination by ADF&G that the sustainable harvest is 10 percent of the deer population (ADF&G, 1989a).

It is assumed that actual deer harvest for 1989 reflects rural and non-rural community demand for deer in WAAs 3313, 3315, and 3731 (Table 3-42). Based on this assumption, the current demand for deer by rural and non-rural communities exceeds the sustainable supply of deer in these WAAs. Additional analysis of the 1989 ADF&G harvest data indicates the current demand for deer by the rural communities alone exceeds the present sustainable supply of deer in all three WAAs. Thus, current deer abundance (abundance defined as ample deer available for harvest) is below the level needed to sustain the current deer harvest by the rural communities harvesting deer in WAAs 3313, 3315, and 3731.

The current demand for deer by rural and nonrural communities exceeds the sustainable supply in the Project Area.

The harvest of proposed units under any of the action alternatives will affect deer abundance in the Project Area. The potential site-specific effects on deer habitat capability (deer habitat capability reflects potential deer abundance) are evaluated in the *Wildlife* section. The deer habitat capability analysis in Chapter 3, *Wildlife* section, indicates that past activities have reduced deer habitat capability 16 percent in the Project Area and that proposed project action alternative effects on habitat capability in the Project Area range from 9 percent in Alternative 4 to 18 percent in Alternative 5. The cumulative reductions from past and currently proposed actions range from 23 percent in Alternative 4 to 31 percent in Alternative 5.

Foreseeable changes in local deer herd distribution are expected in the Project Area when the age of the second growth on the past and proposed timber harvest units reaches 25 years. This conclusion is based on deer habitat utilization studies in Southeast Alaska.

Furbearers

Furbearers are presently being trapped in the Project Area (Tables 3-15 and 3-16). The Forest Service has no information on how many of the trappers harvesting marten, land otters, and other furbearers are from rural communities surrounding the Project Area. The evaluation assumes most of the trappers are from the surrounding rural communities.

Past timber harvest reduced marten habitat capability from 267 marten in 1961 to 244 today. This represents a 9 percent reduction in pine marten habitat capability (Table 3-11). Pine marten habitat capability is assumed to reflect potential marten abundance and furbearer abundance. The *Wildlife* section analysis indicates that the proposed timber harvest alternatives would potentially reduce marten habitat capability an additional 3 to 11 percent.

Changes in local furbearer distribution are expected when second growth in harvested units reaches 25 years old. Timber harvest and regrowth of second growth in harvest units alter furbearer habitat-use patterns.

These levels of habitat capability reduction were projected on the assumption that roads would be closed following timber harvest. If any or all roads are left open for public use, habitat capabilities would further decrease by the amount indicated in Figure G-1 in Appendix G.

Waterfowl

A variety of waterfowl use the fresh and saltwater habitats in the Project Area. Vancouver Canada goose was selected as an indicator of potential project effects on waterfowl. Vancouver Canada goose habitat capability is assumed to reflect potential Vancouver Canada goose abundance and waterfowl bundance. Chapter 4, *Wildlife* section, projects that potential habitat capability for Vancouver Canada goose may decrease from less than 1 percent for Alternative 3 to 5 percent for Alternative 5.

Timber harvest unit locations generally avoid important waterfowl areas. The estuary grass flats, beach fringe, and borders of inland lakes and streams would remain largely unaffected. From Chapter 4, *Wildlife* section, less than 2 percent of the beach and estuary fringe habitat and 9 percent or less of riparian are proposed to be harvested.

Because the potential habitat capability decreases are small and specific habitats will be largely unaffected, abundance and distribution of Vancouver Canada goose and waterfowl in general are not expected to cause a significant possibility of significant restriction to subsistence hunters.

Effects of harvest to waterfowl habitats would be minor. Access, abundance and distribution of Vancouver Canada geese and other waterfowl would be maintained.

Brown Bear

Rural residents within ADF&G Game Management Unit (GMU) 4 and the residents of Kake are allowed to harvest brown bear for subsistence purposes. The Kelp Bay Project Area is within GMU 4. Table 3-14 in the *Wildlife* section displays the brown bear harvest in Wildlife Analysis Areas (WAAs) 3313, 3315, and 3731 since 1980. Most of the brown bear taken in the Project Area are harvested by sport hunters (ADF&G harvest data).

Chapter 3, *Wildlife* section, notes that a 3 percent reduction in potential brown bear habitat capability (Table 3-11) has resulted from past timber harvest in the Project Area. Brown bear habitat capability is assumed to reflect potential brown bear abundance. The overall reduction in brown bear habitat capability indicates the potential reduction in brown bear abundance from past activities has not been substantial.

The *Wildlife* section analysis in this chapter, indicates that proposed timber harvest in the action alternatives would potentially reduce brown bear habitat capability another 1 to 4 percent. When added to the past effects, the habitat capability reduction would range from 3 percent for Alternative 1 to 7 percent for Alternative 5. The projected reductions in habitat capability are based on mitigative measures calling for road closres following logging. If any or all roads are left open to vehicle access decreases in habitat capability would be greater as depicted in Table G-3 in Appendix G.

Table 4-27, *Wildlife* section of this chapter, shows that proposed timber harvest in important brown bear habitats is generally low. Timber harvest in beach and estuary fringe habitats would potentially be less than 2 percent and less than 9 percent in riparian habitat. Important brown bear habitats support the abundance of brown bear necessary for subsistence use.

Changes in local brown bear distribution will occur in the vicinity of ongoing activities during the life of the proposed Project as brown bears tend to avoid contact with people. Brown bears tend to move back into these areas, however, after timber harvest is completed. Foreseeable changes in local brown bear distribution are expected when the age of the second growth on harvest units reaches about 25 years. Because potential habitat capability and availability of important brown bear habitat appear sufficient to meet subsistence needs, there would not be a significant possibility of a significant restriction in subsistence use of brown bear.

Marine Mammals

Federal law prohibits the taking of marine mammals by anyone other than Native hunters. There is no evidence that timber harvest activities have had any effects on marine mammals taken for subsistence. Therefore, there would be no possibility of a significant restriction in subsistence use of marine mammals by the rural communities surrounding the Project Area.

Access

Access to historical subsistence-use areas may be affected where logging activities (such as LTFs, logging camps, and timber harvest) are located in the beach fringe. This is because traditional subsistence access is by boat to the beaches of the Project Area. The effect on access would probably be minor under all alternatives because the area of beach fringe impacted would be 1 percent or less of the total beach fringe in the Project Area.

New and rebuilt roads would provide access to areas that were not previously used for subsistence harvesting of wildlife resources (Alternative Maps). Road access would favor wildlife harvest by logging camp residents who may have motorized vehicles available.

Miles of road proposed for construction are shown in Table 4-90. Residents of Angoon, the closest and most extensive users of the Project Area, do not own off-road vehicles (ORVs) (Personal Conversation, Kookesh, 1990) and may not transport any type of motorized vehicle to the Project Area for subsistence gathering. Response to roads constructed in Sitkoh Bay, another area of timber harvest near Angoon, would support this assumption. Roads in Sitkoh Bay have been used by residents from Sitka and Hoonah using ORVs. Road closure following timber harvest may mitigate some of the concerns over the effects on access.

To the knowledge of the Forest Service, there are no subsistence users dependent on the existing roads in the Project Area. Most of the roads constructed during past timber harvest have become impassible with natural growth of alder and other vegetation. The distance of the Project Area from most rural communities that use the Prject Area (36 to 160 miles), excluding Angoon (12 miles), precludes the expense and utility of transporting vehicles to the Project Area for most subsistence users.

Competition

Competition for wildlife resources in the Kelp Bay Project Area is an issue to residents of Angoon and possibly other subsistence users. Responses o scoping and input during meetings held in Angoon (Kelp Bay Planning Record) reflected concern that competition from logging camp residents would reduce the abundance of wildlife subsistence resources and affect their community's subsistence-use pattern. The Draft EIS recognizes that some increased competition could occur for wildlife resources. Some future residents of the logging camps would be subsistence users. It is possible, though, that some camp residents would be Alaska non-residents and non-rural residents. Most non-rural and Alaska non-residents are employed seasonally by thelogging companies and leave prior to peak hunting times.

Table 4-83 shows the distribution of 1989 deer harvest in WAAs 3313, 3315, and 3731 among rural and non-rural communities. Data appears to support the concern that substantial competition with non-rural hunters is occurring in WAA 3313 and possibly 3731. Sustainable deer abundance in all three WAAs is presently below the level needed to meet deer demand. Potential reduction in deer abundance from past, proposed, and foreseeable land-use activities is substantial.

Table 4-83

1989 Deer Harvest for Wildlife Analysis Areas (WAAs) 3313, 3315, and 3731

	Deer Harvested			Percent Harvested	
WAA	Rural	Non-rural	Total	Rural	Non-rural
3313	132	55	187	71	29
3315	211	5	216	98	2
3731	88	20	108	81	19
Total	431	80	511	84	17

SOURCE: ADF&G, 1989a.

Notes: Total number of deer killed expanded from deer hunter survey. The Project Area is 8 of the 12 VCUs that makeup the 3 Wildlife Analysis Areas (WAAs) that harvest data is reported from.

At some point, the Federal Subsistence Board may have to use its authority to regulate non-subsistence uses of deer due to the competition for deer in the Project Area. They may also have to prioritize the harvest of deer among the rural communities whose residents are harvesting deer in these WAAs. This type of action, as prescribed by Alaska National Interest Conservation Act, Section 804, may be necessary to ensure the availability of adequate abundance of deer needed by the rural communities using the Project Area.

Conclusion

The above analysis leads to the conclusion that the actions proposed in Alternatives 1 through 5 do present a significant possibility of a significant restriction of subsistence use of deer in the Project Area. This finding is based on the potential resource effects by the three evaluation categories shown in Table 4-84. "Yes" indicates a significant possibility of a substantial effect and "no" indicates an insignificant possibility of substantial effect.

Table 4-84
Significant Possibility of a Significant Restriction of Subsistence Use of Wildlife Resources

	Alternative				
	1	2	3	4	5
Abundance or Distribution	yes	yes	yes	yes	yes
Access	no	no	no	no	no
Competition	yes	yes	yes	yes	yes

Note: No" indicates an insignificant possibility of a substantial effect. "Yes" indicates a significant possibility of a substantial effect.

Direct and Indirect Effects Related to Fish and Shellfish

Abundance and Distribution

Salmon

Salmon are a major subsistence food harvested in the Kelp Bay Project Area. Several concerns about potential effects on the fisheries resource surfaced in public comments during scoping. Areas of specific concern were Clear River, Bourbon Creek, Lake Eva Creek, Saook Creek, and Appleton Creek.

The *Fisheries* section of this chapter concludes that potential effects of the proposed timber harvest and road construction alternatives on salmon spawning and rearing habitat would be minimal or eliminated by applying the Forest Service standards, guidelines, and prescriptions described in detail in the Aquatic Habitat Management Handbook (Forest Service [A]) and Soil and Water Conservation Handbook (Forest Service [D]). Specific prescriptions for protecting salmon habitat were incorporated during the design of harvest units and roads. (See Appendix D and E for road and unit cards.) All salmon spawning and rearing streams near proposed timber harvest units are protected by buffers of at least 100 feet as prescribed in the Tongass Timber Reform Act.

Based on the implementation of site-specific prescriptions developed during interdisciplinary meetings for protecting salmon spawning and rearing habitat, the Draft EIS projects that the immediate and foreseeable effects on the abundance and distribution of salmon for subsistence uses in the Project Area would not be measurable.

Other Finfish

The action alternatives for the proposed project would have no immediate or foreseeable effect on other finfish habitat. Because there would be no effect on other finfish habitat, the abundance and distribution of those other finfish would not be affected.

Shellfish

The *Marine and Log Transfer Facilitiess* section, Chapter 4, indicates that less than 0.3 percent of the marine and estuarine habitat in the Project Area would be affected by the construction of LTFs under any of the alternatives. Anticipated reuse of LTFs in Hanus Bay and Appleton Cove, although productive estuarine environments with important crab and shellfish resources, would affect anestimated 2.8 acres of the total 588 acres in these two estuaries. This is 0.5 percent of the estuarine habitat in Hanus Bay and Appleton Cove and does not represent a noticeable impact above that of previous use. Operation of LTFs would result in small effects to benthic organisms. Based on this, the effect on the abundance and distribution of local crabs, clams, and other shellfish would not be measurable for purposes of subsistence. The project effects for the foreseeable future would also not be measurable.

Access

Access to historic subsistence-use fishing areas has not been affected by past land-use activities and would not be affected by any of the proposed alternatives. Nor is there a significant possibility it would be affected in the foreseeable future. This is because traditional access by foot or boat would remain the same. Although logging roads may provide access to reaches of streams that were not previously used for harvesting subsistence salmon, the Forest Service is not aware of any residents from the surrounding rural communities who are currently using existing roads to access reaches of salmon streams in the Project Area to harvest salmon.

If roads are closed following logging, the effect on access to salmon and other finfish harvest areas on national forest lands in the Project Area is not expected to be substantial. This conclusion is based on current information which suggests the roads currently existing in the Project Area are not being used extensively to access salmon, other finfish, and shellfish harvesting areas. There are also ample opportunities to harvest salmon, shellfish, and other finfish in surrounding areas.

Competition

There is potential for competition for salmon, other finfish, and shellfish from logging camp residents during the period of occupancy, which is estimated to be between 2 and 4 years. As indicated in the discussion concerning competition for wildlife, camp residents may be subsistence users but that some would possibly be Alaska non-residents and non-rural residents. There is no evidence to indicate that salmon, finfish, or shellfish availability to subsistence users would be affected by sport or non-rural harvest. Any increase in competition from non-rural residents and Alaska non-residents would not be substantial due to the availability of resources in the immediate vicinity and in the surrounding areas.

Conclusion

This analysis concludes that the actions proposed in Alternatives 1 through 5 do not present a significant restriction of subsistence use of fish and shellfish in the Kelp Bay Project Area. This finding is based on the potential resource effects by the three evaluation categories shown in Table 4-85.

Table 4-85
Significant Possibility of a Significant Restriction of Subsistence Use of Fish Resources

	Alternative 1	2	3	4	5
Abundance or Distribution	No	No	No	No	No
Access	No	No	No	No	No
Competition	No	No	No	No	No

Note: "No" indicates an insignificant possibility of a substantial effect. "Yes indicates a significant possibility of a substantial effect.

Direct and Indirect Effects Related to Other Foods

Abundance and Distribution

Other foods include plants such as kelp, goose tongue, a variety of berries, etc. Most traditional other food gathering occurs near beach and estuarine areas. Timber harvest units and roads proposed in action Alternatives 2 through 5 in the Project Area would infringe upon beach areas potentially used for other food gathering. In the *Wildlife* section, Chapter 4, Table 4-23 shows that 1 percent or less of the beach fringe in the Project Area would be affected by proposed activities under all alternatives. The availability of numerous other food gathering areas in the immediate vicinity would negate the potential impact to rural community residents using those areas.

The timber harvest and road construction activities would improve the availability of berries in the short term wherever activity is proposed in the action alternatives. Based on this increase of berries and the availability of surrounding areas for other food gathering, the project effects and the foreseeable effects are not expected to substantially affect the abundance and distribution of other foods.

Access

Access to traditional other food gathering areas has not been affected by past land-use activities and will not be affected by any of the proposed alternatives. Nor is there a significant possibility that access would be affected in the foreseeable future due to activities proposed in this Project. This is because traditional access by boat or foot would remain the same.


Other foods, such as these salmon berries, are collected for traditonal subsistence purposes.

Existing roads in the Project Area access areas which in the past had not been utilized for the gathering of subsistence resources. The Forest Service is not aware of any residents from the surrounding rural communities who are currently using the roads to access other food gathering sites in the Project Area.

The effect on access to other food gathering areas if roads are closed following logging in the Project Area is not expected to be substantial. There are ample opportunities for food gathering in surrounding areas.

Competition

As indicated in the discussion concerning competition for wildlife, there may be some increased competition for other food resources from rural residents, Alaska non-residents and non-rural residents employed at the logging camps. The increased competition from non-rural residents and Alaska non-residents, however, would not be substantial due to the availability of other food gathering sites in the Project Area and the surrounding areas.

Conclusion

This analysis concludes that the action proposed in Alternatives 1 through 5 do not present a significant possibility of a significant restriction on subsistence use of other food resources in the Project Area. This finding is based on the potential resource effects by the three evaluation categories shown in Table 4-86.

Table 4-86
Significant Possibility of a Significant Restriction of Subsistence Use of Other Food Resources

	Alternative				
	1	2	3	4	5
Abundance or Distribution	no	no	no	no	no
Access	no	no	no	no	no
Competition	no	no	no	no	no

Note: "No" indicates an insignificant possibility of a substantial effect. "Yes" indicates a significant possibility of a substantial effect.

Direct and Indirect Effects Related to Firewood

The Forest Service has a free-use policy for firewood and timber and none of the proposed alternatives will have an adverse effect on the availability of firewood and personal-use timber. Construction of low-angle slides at the LTFs could make personal-use timber more available to individuals.

Cumulative Effects and Long-Term Productivity

The Kelp Bay Project Draft EIS evaluates the cumulative effects on subsistence practices of each alternative. It also evaluates the long-term productivity of the Project Area associated with continued implementation of the TLMP. This subsistence evaluation considers both the cumulative effects of the alternatives on subsistence use and the long-term productivity of the subsistence resource. The difficulty in determining long-term productivity is the uncertainty about the site-specific locations of future activities associate with continued implementation of the Forest Plan. The precise location of future projects is not clearly known until a project is proposed. The evaluation of long-term productivity for subsistence resources concludes whether or not future activities may restrict subsistence uses.

Based on the Life of Sale Plan (Forest Service, 1982b) and the TLMP Land Use Designations for the Project Area, a total of approximately 15,000 acres will be harvestd from the Project Area by 2011 and 32,500 acres by 2060.

The *Wildlife* section projects that this level of harvest would affect the habitat capability of several wildlife species. The changes in habitat capability could affect their abundance and distribution. The potential deer habitat capability is projected to decrease cumulatively from 36 percent in Alternative 3 to 38 percent in Alternative 2 by 2011 (Table 4-31). By 2060, potential deer habitat capability is projected to decrease cumulatively 70 percent (Figure 4-11) representing a substantial effect on deer abundance.

Potential changes in furbearer habitat capability based on the marten habitat capability model are projected into the foreseeable future (2011) to decrease from 20 percent for alternatives 1, 3, and 4 to 21 percent for alternatives 2 and 5 (Table 4-31). At the end of one rotation in 2060, habitat capability is projected to decrease 40 percent. Cumulative effects to brown bear habitat capability would be decreases of 9 percent or less under all alternatives (Table 4-31) by 2011 and 15 percent by 2060 (Figure 4-11).

Projections of habitat capability for marten and brown bear assume mitigative measures are incorporated to address the effects (Figure G-1 and Table G-3 in Appendix G) of vehicle access in the Project Area following logging activities.

These potential decreases in abundance could increase competition for the species important for subsistence. Actions on other lands surrounding the Project Area could also affect the abundance or distribution, access to, and competition for the subsistence resources harvested by the rural communities using the Project Area. Enough is known about currently scheduled and potentially foreseeable activities on other lands surrounding the Project Area to project that subsistence uses might be significantly restricted in the future.

Should subsistence resources become limiting at some point, the Federal Subsistence Board has the authority to regulate non-subsistence use of these resources. This type of action, as prescribed by the Alaska National Interest Lands Conservation Act, Section 804, may be necessary to ensure the availability of adequate subsistence resources needed by the rural communities using the Project Area.

Hearings

On the basis of findings of this analysis and under the provisions of the Alaska National Interest Lands Conservation Act, subsistence hearings will be held on the dates, times, and at the places announced in the letter accompanying the Draft EIS. Letters are being sent to the Federal Subsistence Board, Alaska Department of Fish and Game, Regional Fish and Game Advisory Councils, Local Fish and Game Advisory Committees, and to the Post Offices in Sitka and Angoon where hearings will be held. Announcements will be made in newspapers

and on the radio. Testimony at the hearings can be either verbal or written. People unable to attend are encouraged to have another person submit their written testimony at the hearing. If preferred, people can send written testimony to the Kelp Bay Planning Team if postmarked on or before the date of the hearing in the community the testimony was given. Testimony received, both verbal and written, will be incorporated into this Draft EIS, as determined to be necessary by the Forest Service, to produce the Final EIS.

Other Environmental Considerations

Probable Adverse Environmental Effects Which Cannot be Avoided

Implementation of any action alternative would result in some adverse environmental effects that cannot be effectively mitigated or avoided if the proposed action is to take place. The interdisciplinary procedure used to identify specific harvest units and roads was designed to eliminate or lessen the significant adverse consequences. In addition, the application of standards and guidelines, BMPs, mitigation measures, and a monitoring plan are intended to further limit the extent, severity, and duration of these effects. The specific environmental effects of the alternatives were discussed earlier in this chapter, and the proposed mitigation measures are discussed for each alternative in Chapter 2. Although the formulation of the alternatives included avoidance of potentially adverse environmental effects, some adverse impacts to the environment which cannot be completely mitigated are expected to occur.

Some adverse effects are of a transitory type. For example, air quality will diminish on a recurring though temporary basis due to the road construction, timber harvest, timber hauling and recreation traffic on untreated roads, and the operation of internal combustion engines. These activities will have localized and temporary adverse effects on air quality where these activities occur.

Although standards and guidelines, BMPs, and monitoring plans are designed to prevent significant adverse effects to soil and water, the potential for adverse impacts does exist. Sediment production would exceed natural rates as long as roads are being built and timber is harvested. Sediment would be produced by surface erosion, channel erosion, and mas movement.

Ground-disturbing activities would temporarily increase sediment loads in some streams. This could displace fish, reduce anadromous and resident fish reproductive success, and alter aquatic invertebrate populations. In addition, a loss of fish habitat would occur at road crosings of streams. The portion of a stream bed occupied by a culvert or other structures would be lost as fish habitat.

Disturbance, displacement, or loss of fish and wildlife may occur as a consequence of habitat loss and increased human activity in Project areas. New road construction, and the human activities associated with new access to areas previously unroaded, will result in impacts to fish and wildlife. Improved access into areas that previously had limited roads would have similar effects. The proposed activities will also increase competition for subsistence resources.

Both the amount and distribution of mature and old-growth stands would be reduced through implementation of any action alternative. The rate and severity of adverse impacts varies by alternative. Because some wildlife species rely on habitat conditions provided by old-growth stands, the reduction in the populations of some wildlife species can be expected. As old-

growth and mature timber stands are converted to young even-aged stands, the capability of the Project Area to provide optimal habitat for old-growth dependent species would be reduced.

Timber harvest and road construction in areas that are currently unroaded will alter natural characteristics of these areas. This will modify the recreational experiences that are offered by these areas. Both primitive and semi-primitive recreational opportunities will be lost by these actions. In addition, these development activities will result in a loss of opportunity to consider these areas in future revisions of the Forest Plan, for designation as Wilderness, as Research Natural Areas, or for other purposes requiring natural characteristics.

The natural landscape will appear visually altered by timber harvest, particularly where logging activity is highly visible from travel routes. These adverse effects will eventually be reduced by growth of vegetation. Other impacts on the natural appearance of the landscape include roads and structures which are highly visible despite efforts to blend them with land forms and mitigate the effect by landscaping.

The intensity and duration of these effects depends on the alternative and the mitigation measures applied to protect the resources. Most unavoidable effects are expected to be short-term (usually less than 2 years). In all cases, the effects would be managed to comply with established legal limits, such as a maximum time for regeneration. To check and reduce these effects, monitoring procedures and mitigation measures have been planned for those areas that may be affected. Certain monitoring procedures and mitigation measures are required by existing standards or guidelines. Specific mitigation measures for each alternative are included in Chapter 2.

Relationship Between Short-Term Uses and Long-Term Productivity

All alternatives would come under the mandate of the Multiple Use and Sustained Yield Act of 1969, which requires the Forest Service to manage national forest lands for multiple uses, including timber, recreation, fish and wildlife, range, and watershed. All renewable resources are to be managed such that they are available for future generations. The harvesting and use of standing timber can be considered a short-term use of a renewable resource. As a renewable resource, trees can be reestablished and grow again if the productivity of the land is not impaired.

Maintaining the productivity of the land is a complex, long-term objective. All alternatives protect the long-term productivity of the Project Area through the use of specific standards and guidelines, mitigative measures, and BMPs. Long-term productivity could change as a result of various management activities proposed in the alternatives. Timber management activities will have direct, indirect, and cumulative effects on the economic, social, and biological environment.

Soil and water are two key factors in ecosystem productivity, and these resources will be protected in all alternatives to avoid damage which could take many decades to rectify. Sustained yield of timber, wildlife habitat, and other renewable resources all rely on maintaining long-term soil productivity. Quality and quantity of water from the Project Area may fluctuate as a result of short-term uses, but no long-term effects to the water resource are expected to occur as a result of timber management activities

.

All alternatives would provide the fish and wildlife habitat necessary to maintain viable, well-distributed populations of existing native and desired non-native vertebrate species throughout the Project Area. The abundance and diversity of wildlife species depends on the quality,

quantity, and distribution of habitat, whether used for breeding, feeding, or resting. Management Indicator Species (MIS) are used to represent the habitat requirements of all fish and wildlife species found in the Project Area. By managing habitats and populations of indicator species, the other species associated with the same habitat would also benefit. The alternatives provide standards, guidelines, and mitigation measures for maintaining long-term habitat and species productivity. The alternatives vary in the risk presented to both wildlife habitat and habitat capability.

Timber rotations are normally over 100 years. To ensure adequate production of timber, harvest has been scheduled to allow the earliest cut stands to mature into merchantable timber before the planned harvest of original stands is complete. When the first rotation is complete, mature timber stands would be harvested again on a new rotation. Management of the timber resource on these rotations could affect long-term productivity depending on the intensity of silvicultural practices. Projected timber rotation lengths are not anticipated to affect long-term productivity. Mitigation measures are planned under all the alternatives to ensure future availability of other renewable resources as well.

Opportunities for dispersed recreation use, including hiking, camping, fishing, hunting, using all-terrain-vehicles, and viewing the natural scenery, will be maintained and increased for future generations. The setting in which these activities occurs varies by alternative, but the long-term potential of the Project Area to provide a spectrum of recreation opportunities would be maintained in all alternatives.

While some timber management practices reduce long-term productivity by causing soil erosion or loss of habitat critical to fish and wildlife species, the desired future condition of the Project Area under the preferred alternative will maintain integrated ecological functions. For example, timber management activities such as timber harvesting and road construction alter the natural-appearing landscape and have adverse effects on the water quality, soil productivity, and interior forest habitat values. These impacts will be reduced by riparian protection standards, use of BMPs for road construction, use of silvicultural systems other than clearcutting, retention of snags and large down woody material in harvest units, and protection of large tracts of older forest habitat distributed within the managed forest landscape. In visual corridors, there was an attempt to avoid or mitigate the long-term effects of management activities; however, for some alternatives, visual management objectives will not be met in all VCUs.

Irreversible and Irretrievable Commitments of Resources

Irreversible commitments of resources are decisions to use, modify, or otherwise affect nonrenewable resources such as cultural resources or minerals. Irreversible commitments could also apply to resources that are renewable only over a long period of time such as soil productivity or old-growth forests. Such commitments of resources are considered irreversible because the resource has deteriorated to the point that renewal can occur only over a long period of time or at a great expense, or the resource has been destroyed or removed. All alternatives result in some irreversible commitments, although the extent and potential for adverse effects increase in alternatives which emphasize resource extraction and utilization.

Irretrievable commitments represent opportunities foregone for the period of the proposed actions, during which other resource utilization cannot be realized. These decisions are reversible, but the utilization opportunities foregone are irretrievable. Under multiple-use management, some irretrievable commitments of resources are unavoidable due to the mutually exclusive relationship between some resources. An example of such a commitment is development at logging camps and LTFs that will be removed at the completion of logging

activities. These developments occupy approximately 3 to 5 acres, and include bunkhouses, mobile homes, fuel storage facilities, etc. For the 3 to 5 years that such developments exist, the opportunity to otherwise utilize these areas is foregone, thus irretrievable.

The irreversible disturbance of some types of cultural resources may occur as a consequence of management activities. This would be especially true for subsurface resources that cannot be located through surface surveys. Even with mitigation, unanticipated or unavoidable disturbances can result in the loss of cultural values. Mitigation efforts such as data recovery involve the scientific and controlled destruction of a cultural resource site. Once undertaken, the effects are irreversible and the mitigation effort becomes an irretrievable commitment to the resource.

The use of energy resources and the removal of mineral resources are irreversible commitments of resources. The utilization of rock resources for road and facility construction would be an example. The use of fossil fuels during Project administration activities would be an irreversible resource commitment. Alternatives vary by the amount of energy and mineral resources used; only the No Action alternative abstains from the use of these non-renewable resources at this time.

In unroaded areas, development activities such as timber harvest and the road construction associated with harvest will irreversibly reduce the potential amount of area that could be designated as a part of the National Wilderness Preservation System, managed as a Research Natural Area, or managed for other purposes requiring natural characteristics.

An irreversible loss occurs when forests of old-growth trees are harvested, fragmented, or removed for the construction of roads, or other purposes. Old-growth stands provide key wildlife habitat and are also valued for ecological and aesthetic reasons. Because old-growth stands take more than 200 years to develop, the commitment of this resource to certain uses is reversible only over a long period of time.

Some long-term uses of the land cause an irreversible loss of soil productivity. Examples of these uses include the establishment of arterial and collector roads and log-transfer facilities.

Possible Conflicts with Plans and Policies of Other Jurisdictions

The regulations for implementing the National Environmental Policy Act (NEPA) require a determination of possible conflicts between the proposed action and the objectives of Federal, State, and local land use plans, policies, and controls for the area. The major land use regulations of concern are the Coastal Zone Management Act (CZMA), Section 810 of the Alaska National Interest Lands Conservation Act (ANILCA), and the State of Alaska's Forest Practices Act. A discussion of each of these determinations is presented below.

Coastal Zone Management Act of 1976 (CZMA)

The CZMA was passed by Congress in 1976 and amended in 1990. This law as amended requires Federal agencies conducting activities or undertaking development affecting the coastal zone to ensure that the activities or developments are consistent with approved State coastal management programs to the maximum extent practicable. The State of Alaska passed the Alaska Coastal Management Act in 1977 to establish a program that meets the requirements of the CZMA. It contains the standards and criteria for a determination of consistency for activities within the coastal zone.

The Alaska Coastal Management Program (ACMP), in turn, encouraged local coastal communities to develop local policies guiding the development of coastal resources. The City and Borough of Sitka participates in the program and has established the Sitka Coastal Management Citizens Committee, of which the Forest Service is a member. The City and Borough has also developed the Sitka District Coastal Management Program, which has as its goal "...to achieve wise use of the land and water resources of the coastal area and to balance economic growth with ecological and cultural values, so as to maintain and protect Sitka's coastal resources for the beneficial use and enjoyment for present and future generations." The Kelp Bay Project Area lies entirely within the boundary of the Sitka District Coastal Management Program.

The Coastal Zone Management Act requires that activities be in accordance with approved State coastal management programs.

The Forest Service will evaluate the preferred alternative prior to completion of the Final EIS and the Record of Decision to ensure that the activities and developments affecting the coastal zone are consistent with approved coastal management programs to the maximum extent practicable.

Alaska National Interest Lands Conservation Act of 1980 (ANILCA)

Under Section 810 of ANILCA, agencies are required to evaluate the effects of proposed actions on subsistence uses of Federal land and to determine if the proposed action might significantly restrict subsistence opportunities. Refer to the *Subsistence* section of this chapter for the evaluation of impacts to subsistence use as a result of the alternatives.

State of Alaska's Forest Practices Act of 1990

On May 11, 1990, Governor Cowper approved the legislatures's major revision of the State's Forest Practices Act (FPA). The revised act significantly increases the State's role in providing protection and management for important forest resources on State and private lands. The revised Forest Practices Act will also affect national forest management through its relationship to the ACMP and the Federal CZMA (see above discussion).
For national forest timber operations, such as proposed for the Kelp Bay Project, the effect of the revised Forest Practices Act is essentially two-fold. First, it clarifies that the revised Forest Practices Act is the standard which must be used for evaluating timber harvest activities on Federal lands for purposes of determining consistency to the maximum extent practicable with the Alaska Coastal Zone Management Program. Second, it calls for minimum 100-foot buffers on all Class I streams, and recognizes that consistency to the maximum extent possible for purposes of the Alaska Coastal Management Program is attainable in Federal timber harvest activities using specific methodologies which may differ from those required by the revised Forest Practices Act or its implementing regulations.

The Tongass Timber Reform Act of 1990 prohibited commercial timber harvesting within buffer zones established on all Class I streams, and those Class II streams which flow directly into a Class I stream. Buffer zones have a minimum width of 100 feet slope distance from the edge of either side of the stream. In addition, the Forest Service is currently working with the Alaska State Division of Government Coordination on a revision of the Memorandum of Understanding (MOU) between the State and the Forest Service. This revised MOU will establish the policies and procedures for coordinating State review of Forest Service programs and activities, including those covered by the Forest Practices Act and the Alaska Coastal Management Program.

The Forest Service will evaluate the preferred alternative prior to completion of the Final EIS and the Record of Decision to ensure that the activities and developments specifically covered by the Forest Practices Act are consistent with its provisions to the maximum extent possible.

Energy Requirements and Conservation Potential of Alternatives

The implementation of the proposed actions in the Kelp Bay Project Area will require the expenditure of energy (e.g., fuel consumption). The amount of energy used varies by alternative based on timber volume harvested and miles of road constructed or reconstructed. The direct effect of the alternatives on energy requirements would be attributed to timber harvest, road construction and reconstruction, and travel necessary to administer the timber sale. Indirect energy requirements include processing wood products and the transport of the products to secondary processors and consumers. The estimated total fuel consumption required for each alternative is displayed in Table 4-87.

Fuel consumption during harvest activities, predominantly for transportation by truck and boat, varies from alternative to alternative.

Natural or Depletable Resource Requirements and Conservation Potential of Alternatives

Table 4-87
Estimated Fuel Consumption (millions of gallons)

	Alternatives 1	2	3	4	5
Preparation and Administration (1.56 gallons/MBF)	0	0.168	0.149	0.106	0.283
Logging and Transportation (14.8 gallons/MBF)	0	1.590	1.415	1.006	2.689
Road Construction and Maintenance (4,000 gallons/mile)	0	0.480	0.380	0.344	0.600
Total Consumption	0	2.238	1.944	1.456	3.572

Note: The estimated fuel consumption for timber harvest activities is based on consumption per MBF of sawlog volume. Sawlog volume is estimated to be 79 percent of the total volume harvested.

All alternatives considered in detail are designed to conform to applicable laws and regulations pertaining to natural or depletable resources, including minerals and energy resources. Regulation of mineral and energy activities on the national forest, under the U.S. Mining Laws Act of May 1872 and the Mineral Leasing Act of February 1920, is shared with the Bureau of Land Management (BLM). The demand for access to national forest lands for the purpose of mineral and energy exploration and development is expected to increase over time.

The action alternatives propose road construction that will increase opportunities for access to the national forest within the Kelp Bay Project Area. This increased access may result in increased activity with regard to both known and potential mineral or energy resource occurrences. There are six known mineral prospects in the Project Area. These prospects indicate occurrences of copper and gold. At this time, there does not seem to be much interest in the known mineral occurrences, as there are no mining claims. The actual potential for increased mineral or energy resource activity in the Project Area is not known, nor can an accurate estimate be made.

Urban Quality, Historic and Cultural Resources, and the Design of the Built Environment

The Kelp Bay Project Area contains no urban areas or built-up area of any kind. Therefore, the only applicable concern under this topic is with historic and cultural resources. The goal of the Forest Service's Cultural Resource Management Program is to preserve significant cultural resources in their field setting and ensure they remain available in the future for research, social/cultural purposes, recreation, and education. The direct, indirect, and cumulative effects of the alternatives on cultural resource have been evaluated. The result of this evaluation is the determination that there are adequate standards, guidelines, and procedures to protect cultural resources and to meet the goals of the Cultural Resource Management Program. Cultural resources are discussed further in the *Cultural* section of this chapter.

Effects of Alternatives on Consumers, Civil Rights, Minorities and Women

All Forest Service actions have the potential to produce some form of impact, positive and/or negative, on the civil rights of individuals or groups, including minorities and women. The need to conduct an analysis of this potential impact is required by Forest Service Manual and Handbook direction. The purpose of the impact analysis is to determine the scope, intensity, duration, and direction of impacts resulting from a proposed action. For environmental or natural resource actions, such as proposed for the Kelp Bay Project, the civil rights impact analysis is an integral part of the procedures and variables associated with the social impact analysis. This analysis is discussed in this chapter in the section on the *Economic and Social Environment.*

The effect of the alternatives on consumers is reflected in the discussion of the various goods and services supplied as a result of the proposed actions. This analysis occurs throughout the chapter as an integral part of the analysis of the effects on other components of the environment.

Effects of Alternatives on Prime Farm Land, Rangeland, and Forest Land

All alternatives are in keeping with the intent of Secretary of Agriculture Memorandum 1827 for prime land. The project area does not contain any prime farm lands or rangelands. Prime forest land does not apply to lands within the national forest system. In all alternatives, lands administered by the Forest Service would be managed with a sensitivity to the effects on adjacent lands.

Effects of Alternatives on Threatened and Endangered Species, and Critical Habitat

There will be no adverse impacts to any Federally listed threatened and/or endangered species or critical habitat as a result of this project. The Humpback whale and the Stellar's sealion are the two known threatened and/or endangered species that inhabit the project area. The discussion of the effects of the alternatives on threatened and/or endangered species is presented in this chapter in the *Wildlife, Fish,* and *Vegetation* sections.

Chapter 5

List of Preparers

Chapter 5

List of Preparers

US Forest Service

Janis Burns Buyarski, Team Leader

B.S., Forestry, University of Illinois-Urbana, 1977

Forest Service: 13 years
- Planning Team Leader, Tongass NF, Chatham Area (2 years)
- SEIS Planning Team Leader, Tongass NF, Stikine Area (1 year)
- Program Manager-Computer Systems, Tongass NF, Stikine Area (2 years)
- Timber Sale Contract and Appraisal Specialist, Tongass NF, Stikine Area (2 years)
- Pre-Sale Forester, Wrangell RD, Tongass NF, Stikine Area (1 year)
- Pre-Sale Forester, Idaho City RD, Boise NF (3 years)
- Forestry Technician, Sault Ste Marie RD, Hiawatha NF (2 years)

Other Relevant Employment:
- Consulting Forester, self employed (2 years)
- Soils Research Laboratory Assistant, University of Illinois (4 years)

Joseph E. Costa, Transportation Planner

B.S., Botany, Chico State University, California, 1969
A.A., Civil Engineering Technology, Shasta College, 1967

Forest Service: 23 years
- Transportation Planner, Sitka RD, Tongass NF, Chatham Area (2 years)
- Forest Transportation Planner, Mendocino NF (8 years)
- District Engineer, Lassen NF (6 years)
- Design Team Leader, Six River NF (2 years)
- Survey & Design Party Chief, Shasta-Trinity NF (5 years)

Nida Crumley, GIS Technician

Forest Service: 3 years
- GIS Technician, Tongass NF, Chatham Area (23 months)
- Computer Clerk, Tongass NF, Chatham Area (1 year)
- Cart. Aid., Tongass NF, Chatham Area (19 months)

Stanley D. Davis, Forest Archeologist

B.A., Anthropology, University of Northern Colorado, 1971
M.S., Social Science/Archaeology, University of Northern Colorado, 1973

Forest Service: 14 years
Forest Archeologist, Tongass NF, Chatham Area (14 years)

Other Relevant Employment:
Instructor, University of Alaska, Juneau (1 year)
Instructor, Islands Community College, Sitka, Alaska (2 years)
Assistant State Archaeologist, Utah (1 year)
Independent Contractor - Archaeology (2 years)
Assistant Director, Sonora Archaeological Program, Arizona (2 years)
Teaching Assistant, Anthropology Department, University of Northern Colorado (1 year)

Clifford A. Edenshaw, Subsistence Coordinator

B.S., Forest Management, University of Washington 1989

Forest Service: 5 years
Forester, Sitka RD, Tongass NF (2 years)
Seasonal Employee, Quilcene RD, Olympic NF (2 years)
Seasonal Employee, Entiat RD, Wenatchee NF (1 year)

Theodore W. Falkner, GIS Coordinator

Forestry, Humboldt State, 1956-1960
Civil Engineering, Humboldt State, 1960-1962
Civil Engineering, Los Angeles State, 1964-1966

Forest Service: 33 years
GIS Coordinator, Tongass NF, Chatham Area (4 years)
Planner, Tongass NF, Chatham Area (5 years)
Transportation Planner and Logging Engineer, Klamath NF (12 years)
Transportation planner, Logging Engineer, Sequoia NF (4 years)
Survey Technician, Design Engineer, Angeles NF (4 years)
Survey Technician, Klamath NF (4 years)

Bradley Flynn, Road Locator/Ground Verfication Team

A.S., Natural Resources Conservation, State University of New York, 1975
B.S., Recreation, University of Idaho, 1977

Forest Service: 13 years
Civil Engineering Technician, Tongass NF, Chatham Area (2 years)
Civil Engineering Technician, Nezperce NF (9 years)
Civil Engineering Technician, Horse Creek Research Project, Nezperce NF and Intermountain Research Station (2 years)
Forestry Technician, Elk City RD, Nezperce NF (6 months)

Fred Glenn, Crew Leader/Ground Verification Team

B.S., Botany, Weber State College, 1967
M.S., Soils, Washington State University, 1970
PhD., Soils, Washington State University, 1973

Forest Service: 17 years
Soil Scientist, Tongass NF (17 years)

Other Relevant Employment:
Forest Soils Research, Oregon State University (3 years)
Soil Erosion Research, Purdue University (2 years)

Susan Gorder, Computer Programmer Analyst, ORACLE and GIS Support

A.A., Civil Engineering Technology, American River College, 1982

Forest Service: 6 years
Computer Programmer Analyst, Tongass NF, Chatham Area (4 years)
Engineering Technician, Tongass NF, Chatham Area (2 years)

Barth Hamberg, Landscape Architect

B.S., Agricultural Economics, University of Vermont, 1980
M.L.A., Landscape Architecture, Harvard University, 1984

Forest Service: 8 years
Landscape Architect, Tongass NF, Chatham Area (3 years)
Landscape Architect, Tongass NF, Ketchikan Area (5 years)

Robert H. Huecker, Soil Scientist

B.S. Resource Management, University of Wisconsin-Stevens Point, 1976

Forest Service: 14 years
Soil Scientist, Tongass NF, Chatham Area (5 years)
Soil Scientist, Thorne Bay RD, Tongass NF, Ketchikan Area (3.5 years)
Soil Scientist, Chugach NF (5.5 years)

Other Relevant Employment:
Soil Conservationist, Dunn County Soil and Water Conservation District, Menomonie, Wisconsin (15 months)

Daniel Kelliher, Hydrologist

B.S., Hydrology, University of New Hampshire, 1977

Forest Service: 13 years
Hydrologist, Tongass NF, Chatham Area (13 years)

Michelle Anderson Lebatard, Geographical Information Systems Technician

Psychology/Computer Science, Brigham Young University

Forest Service: 2 years
GIS Technician, Tongass NF, Chatham Area (25 months)
Cart. Aide, Tongass NF, Chatham Area (2 months)
Marking crew, Ochoco NF (6 months)

Virginia Lutz, GIS Technician

B.A., Biology, Southwest State University, Minnesota, 1982

Forest Service: 2.5 years
Computer Clerk, Tongass NF, Chatham Area (22 months)
GIS Technician, Tongass NF, Chatham Area (7 months)

Scott A. Maki, Hydrologist

B.S., Biology and Geology, University of Minnesota-Duluth, 1980

Forest Service: 8 years
Hydrologist, Tongass NF, Chatham Area (3 years)
Hydrologic Technician, Tongass NF, Chatham Area (4 years)
Hydrologic Technician, Institute of Northern Forestry (1 year)

Domenick Monaco, Landscape Architect

B.S., Landscape Architecture, Pennsylvania State University, 1972

Forest Service: 11 years
Forest Landscape Architect, Tongass NF, Chatham Area (11 years)

Other Relevant Employment:
Landscape Architect, U.S. Corps of Engineers, Savannah, GA (2 years)
Landscape Architect, GWSM, Inc., Pittsburgh, PA (7 years)

Mary Clay Muller, Lands and Minerals Specialist

B.A., Biology, Central Washington University, 1971
M.S., Botany, Central Washington University, 1973

Forest Service: 12 years
Botanist, Tongass NF, Chatham Area (5 years)
Lands and Minerals Specialist, Tongass NF, Sitka Ranger District (7 years)

Mary Beth Nelson, Recreation Planner

B.S., Recreation Area Management, Montana State University, 1979

Forest Service: 10 years
Recreation Planner, Tongass NF, Chatham Area (4 years)
Architectural Technician, Tongass NF, Chatham Area (4 years)
Architectural Technician, Kootenia NF (2 years)

Steve J. Paustian, Hydrologist

B.S., Watershed Management, Colorado State University, 1974
M.S., Forest Hydrology, Oregon State University, 1977

Forest Service: 16 years
Hydrologist, Tongass NF, Chatham Area (14 years)
Hydrologist, Big Horn NF (2 years)

Other Relevant Employment:
Research Assistant, Forest Hydrology, Oregon State University (2 years)

Kathy Peterson, Transportation Planner

B.A., History, Washington State University, 1971

Forest Service: 13 years
Transporation Planner, Tongass NF, Chatham Area (4 years)
Civil Engineer Technician, Okanogan NF (9 years)

Victor J. Starostka, Fisheries Biologist

B.S., Biology, University of Wisconsin-Stevens Point, 1967
M.S., Wildlife Biology, South Dakota State University, 1969

Forest Service: 15 years
Area Fisheries Biologist, Tongass NF, Chatham Area (5 years)
Forest Fisheries Biologist, Umpqua NF (6 years)
Zone Fisheries Biologist, Dixie, Fishlake, Manit-LasSal NF's (4 years)

Other Relevant Employment:
Project Leader, Flaming Gorge Reservoir Investigations, Utah (5 years)
Fisheries Biologist, Glen Canyon Reservoir Investigations, Utah (2 years)
Fisheries Biologist, North Central Reservoir Investigations, NMFS (2 years)

Karen Swanson-Iwamoto, Archaeologist

B.A., Anthropology, Oregon State University, 1979
B.A., History, Oregon State University, 1979

Forest Service: 10 years
Archaeologist, Tongass NF, Chatham Area (9 years)
Archaeology Technician, Malhuer NF (1 year)

Other Relevant Employment:
Archaeology Technician, Burley District, BLM (1 year)
Independent Contractor, Archaeology, Pacific NW and SE (2 years)

James M. Thomas, Forester and Operations Research Analysis

B.A., Biology, University of Colorado, 1974
Civil/Chemical Engineering, University of Colorado, 1969-1972
Geology, Western State College, Colorado, 1978-1979
Forestry/Natural Resource Planning, Colorado State University, 1980-1981

Forest Service: 13 years
Forester, Kelp Bay and SE Chichagof Planning Teams, Sitka RD, Tongass NF, Chatham Area (2 years)
Information Systems Group Leader, Tongass NF (3 years)
Information Systems Group Leader, Arapaho and Roosevelt NF (2 years)
Operations Research Analyst, Shawnee NF (2 years)
Natural Resource Planner, White River NF (1 year)
Lead Forestry Technician, Clear Creek RD, Arapaho and Roosevelt NF (2 seasons)
Wilderness Planner, San Juan and Rio Grande NF (1 year)
Wilderness Planner, Holy Cross RD, White River NF (1 year)

Stanton Turley, Forester/Ground Verification Team

B.S., Forest Management, Oregon State University, 1983
Forest Engineering Institute, Oregon State University, 1989

Forest Service: 8 years
- Forester, Sitka RD, Tongass NF, Chatham Area (2 years)
- Forestry Technician, Sitka RD, Tongass NF, Chatham Area (1 season)
- Forestry Technician, Hoonah RD, Tongass NF, Chatham Area (4 years)
- Survey Technician, Juneau RD, Tongass NF, Chatham Area (1 season)
- Forestry Aid, Waldport RD, Siuslaw NF (1 year)

Michael J. Weber, Wildlife Biologist

M.S., Wildlife Biology, South Dakota State University-Brookings, 1978
B.S., Wildlife Conservation, University of Missouri-Columbia, 1975

Forest Service: 14 years
- Wildlife Biologist Planner, Sitka RD, Tongass NF, Chatham Area (2 years)
- Resource Assistant-Wildlife Biologist, Winona RD, Ouachita NF (2 years)
- Wildlife Biologist, Tiak RD, Ouachita NF (10 years)

Other Relevant Employment:
- Wildlife Research Assistant, South Dakota State University (2 years)

Randolph A. West, Soils Scientist

M.S., Pedology, Ohio State University, 1979
B.S., English, Miami University, 1974

Forest Service: 11 years
- Forest Soil Scientist, Tongass NF, Chatham Area (4 years)
- Ecologist, Tongass NF, Ketchikan Area (2 years)
- Soil Scientist, Rio Grande NF (6 months)
- Soil Scientist, Shoshone NF (6 months)
- Soil Scientist, Tongass NF, Chatham Area (4 years)

Other Relevant Employment:
- Research Assistant, Agronomy Department, Ohio State University (3 years)
- Soils Laboratory Technician, Agronomy Department, Ohio State University (1.5 years)

Robert Wetherell, Landscape Architect

B.L.A., Landscape Architecture, University of Georgia, 1985

Forest Service: 7 years
- Landscape Architect, Thorne Bay RD, Tongass NF (7 years)

Richard R. Zaborske, Logging Systems Expert and Silviculturist

B.S., Forest Management, University of Wisconsin-Stevens Point, 1977
M.F., Forest Engineering, Oregon State University, 1989
Certified Silviculturist, Forest Service, 1985 to Present

Forest Service: 12 years
- Planning Team Logging System Specialist, Sitka RD, Tongass NF, Chatham Area (2 years)
- Advanced Technical Training - Logging Systems and Transportation Planning, Oregon State University-Corvallis (2 years)
- Zone Silviculturist and Post-Sale Forester, Cloudcroft RD, Lincoln NF (5 years)
- Soil Scientist, Prescott NF (3 years)

Other Relevant Employment:
- Soil Scientist, Soil Conservation Service, Fort Worth, Texas (2 years)

Temporary/Seasonal Employees

John Hicks, Volunteer, Sitka RD, Tongass NF (5 months)

Michelle Hicks, Volunteer, Sitka RD, Tongass NF (5 months)

Simone Machammer, Volunteer, Sitka RD, Tongass NF (3 months)

Irene Platt, Volunteer, Sitka RD, Tongass NF (4 months)

Dick Sky, Volunteer, Sitka RD, Tongass NF (3 months)

Dan Sloop, Volunteer, Sitka RD, Tongass NF (3 months)

Mark Thompson, Seasonal, Sitka RD, Tongass NF (3 months)

Photo Contributors

Robin Bergey
Coon Bros.
Joseph E. Costa
Russ Dixon
V. Sobaloff
Richard R. Zaborske

Chapter 6

List of Agencies, Organizations, and Persons to Whom Copies of this Statement Were Sent

Chapter 6

List of Agencies, Organizations, and Persons to Whom Copies of this Statement Were Sent

Name	Organization
Alaska	
Anchorage	
	Alaska Land Use Council
Steven C. Borell	Alaska Miners Association
Mr. Curtis V. McVee	Alaska Miners Assoc., Inc.
Susan Cantor	Environmental Protection Agency
Dan Robison	Environmental Protection Agency
Judith E. Bittner	State Historic Preservation Officer
Mr. Michael Amaral	US Fish & Wildlife Service
Mr. & Mrs. James Brennan	
Dr. Jack Kruse	

	Name	Organization
Angoon		
	Ms. Geraldine Nelson	ACMP Coordinator
	Mr. Daniel Johnson Jr.	Alaska Native Brotherhood Grand Camp 2nd V.P.
	Albert Kookesh	Alaska Native Brotherhood Grand Camp Secretary
	Mr. Cyrus E. Peck	Alaska Native Brotherhood Executive Committee
	Mr. Garfield George	Angoon Advisory Committee
	Mr. Gordy Williams,	Angoon Advisory Committee
	Mr. Wally Frank, Sr.	Angoon Community Association
		Angoon Community Association
	Ms. Maxine Thompson	Angoon Tlingit & Haida
	Ms. Francine Willis	Alaska Native Sisterhood Camp #7
		City and Borough of Angoon
	Peter Jack	Kootznoowoo, Inc.
	K.J. Metcalf	
	Mathew J. Fred Sr.	
	Richard Powers	Whalers Cove Lodge
	Frank Sharp	
Auke Bay		
	Karla Hart	Alaska Rainforest Treks
		Chatham Cannery, Ltd.
	William D. Field	Field Construction
	John Berthall	Indian Cove Water Users Assoc.
Craig		
		Shaan-Seet, Inc.

	Name	Organization
Dillingham		
	H. Clough & Rollin Young	
Douglas		
	Rob Bosworth	Alaska Department of Fish & Game Subsistence Division
	Rod Flynn	Alaska Department of Fish and Game
	Gary Gunstrom	Alaska Department of Fish & Game Commercial Fisheries Division
	Roger Harding	Alaska Department of Fish & Game Sportfish Division
		Alaska Department of Fish & Game Commercial Fisheries
		Alaska Department of Fish & Game FRED Division
	John Schoen	Alaska Department of Fish & Game
	Leon Shaul	Alaska Department of Fish & Game
	Ms. Sue Sargent	Alaska Native Sisterhood Grand Camp President
	R. Lium	P.A. Adjoiners
	Joe Smalten	P.A. Adjoiners
	Dale Anderson	Admiralty Tours
Elfin Cove		
		Chichagof Charters
Gustavus		
	Jimmie C. Rosenbruch	Glacier Guides, Inc.
	Natham Borson	Spirit Walker Expeditions
	Gregory Johns	Spirit Walker Expeditions

	Name	Organization
Hoonah		
	Albert Dick	Alaska Native Brotherhood Camp # 12 Hoonah Adv. Committee
	Ray Dick	Alaska Native Brotherhood Natural Resource Association
	Frank See	Alaska Native Brotherhood Executive Committee Pres.
	Trudy Wolfe	Alaska Native Sisterhood Grand Camp #12
	Liv Gray	City of Hoonah
		Hoonah Cold Storage
		Hoonah Indian Association
		Huna Totem Corporation
	Edward Stewart	Whitestone Logging, Inc.
	Keith Walker	Whitestone Logging Co.
	Liv Gray	
Hydaburg		
		Haida Corporation
Juneau		
	Anthony Smith	Alaska Department of Commerce, Economic
	Bill Janes	Alaska Department of Environmental Conservation
	Chris Kent	Alaska Department of Environmental Conservation
	Dick Stokes	Alaska Department of Environmental Conservation

Name	Organization
	Alaska Department of Fish & Game
William W. Garry	Alaska Department of Natural Resources
Chris Landis	Alaska Department of Natural Resources, Div. of Land & Water Mgt
Tom Lawson	Alaska Department of Natural Resources-Research & Development
Lynn McGowen	Alaska Department of Natural Resources
Bob Merry	Alaska Department of Natural Resources
Andy Pekovich	Alaska Department of Natural Resources
S.E. District Forester	Alaska Department of Natural Resources
Mar Winegar	Alaska Department of Natural Resources
Ken Leghorn	Alaska Discovery
M. Behr	Alaska Travel Adventures
Judy Shuler	Alaska Up Close
	Alaska Department of Commerce & Economic Development
	Alaska Department of Commerce and Regional Affairs, Municipal & Reg. Asst.
William Leitch	Alaska Department of Economic Development
Bart Watson	Armstrong-Keta Inc.
Chuck Chandler	Baja Alaskan Experiences
Avrum Gross	Chatham Cannery Ltd.

Name	Organization
	Alaska Department of Commerce & Economic Development
Geoffrey B. Whistler	Alaska Department of Commerce & Economic Development
Ms. Lucy Hudson	Congressional Office
Congressman Don Young	
Bruce Johnson	Division of Forestry
	Eagle Express Line
Rick Rolston	Earth First
Joe Wilson Sr.	Goldbelt, Inc.
President	Huna Totem Corporation
	Juneau Audubon Society
	Klukwan, Inc.
Andrew Spear	Marine Adventure Sailing Tours
Richard Reynolds	Mendenhall Glacier Transport
Dwayne Petersen	National Marine Fisheries Svc.
Steven T. Zimmerman	Chief Habitat, National Marine Fisheries Svc.
Director	Office of Forest Products
James F. Clark	Robertson, Monagle & Eastaugh
Executive Director	Southeast Alaska Environmental Conservation Coalition (SEACC)
Richard Harris	Sealaska Corporation
Robert W. Loescher	Sealaska Corporation
Byron Mallott	Sealaska Corporation

Name	Organization
Sen. Frank Murkowski	
Sen. Ted Stevens	
	Sierra Club, Juneau Group
Dick Buhler	Silver Bay Logging
Joe Mehrkens	Southeast Alaska Natural Resource Center
Bonnie Campbell	S.E. United Methodist Camp
Diane Mayer	State of Alaska/OMB-DGC
Judith Cooper	Taku Conservation Society
Kathryn & Ron Maas	Taku Glacier Lodge
Carl Rosiers	Territorial Sportsmen
Office of the Governor	Timber Task Force
	Tlingit-Haida Central Council
	Tlingit & Haida Fisheries
Judith George	Tlingit and Haida Central Council
Ed Thomas	Tlingit & Haida Central Council
	U.S. Environmental Protection Agency
Michael Jacobson	U.S. Fish & Wildlife Service
Geron Bruce	U.S.A.G.
	USDI-BIA, Forestry/S.E. Agency
Nevin Holmberg	U.S. Fish and Wildlife Service
Don Williamson	U.S. Fish and Wildlife Service
Vivian Hoffman	Admiralty National Monument Manager
	U.S.D.A. Forest Service Information Center

Name	Organization
	Westours, Inc.
Mike Miller	Wilderness Acquisitions
Dale Young	Wilderness Acquisitions
James King	The Wildlife Alaska Society
	Wildlife Conservation Fund
Randy Bayliss	
D. Blackwell	
Dick Eliason	
Mr. & Mrs. Clark Gruening	
Ben Grussendorf	
Phil Holdsworth	
M. J. Kirchoff	

Kake

Thomas L. Jackson, Sr.	Alaska Native Brotherhood Executive Committee
Alberta Shaquanie	Alaska Native Sisterhood Camp #10
Bill Cheney,	ACMP Representative, City of Kake
Donald James, Mayor	City of Kake
Lonnie Anderson	Kake Advisory Committee
Lincoln A. Bean	Kake Tlingt and Haida Camp #10
Clarence Jackson	Kake Tribal Corporation
Samuel Jackson Sr.	Organized Village of Kake
Clarence Jackson	Sealaska Corporation

	Name	Organization
Kasaan		
	Louis Thompson	Kavilco, Inc.
Ketchikan		
	William K. Williams	Cape Fox Corporation
	Kathryn Troll	Southeast Alaska Seiners Association
	K. Hank Fletcher	P.A. Adjoiners
	Ray Roberts	
Klawock		
	Leonard Kato	
Kodiak		
	Greg Petrich	
Pelican		
	Edith Carlson	City of Pelican
	Carol J. Jorgensen	City of Pelican
	Ms. Jenny Weaver	Coastal Zone Management Coordinator
	Paul Corbin	Lisianksi Lodge
	Bill Odell	Pelican Planning Commission Chairman
	Ruth Parker	Pelican Advisory Committee
Petersburg		
	D. A. Coon,	Mayor City of Petersburg
	Ronald R. Humphrey	Stikine Area Forest Supervisor
		News Director, KFSK
		Petersburg Chamber of Commerce
		Petersburg Pilot

	Name	Organization
Point Baker		
	Roman Keleske	Community Association
	Gretchen Goldstein	Sumner Strait Advisory Comm.
	Joe Sebastian	Sumner Strait Advisory Comm.
Port Alexander		
		City of Port Alexander
	Mark Kirchoff	City of Port Alexander
	Jim Lange	Port Alexander Advisory Committee
Sitka		
	Dave Hardy	Alaska Department of Fish and Game
	Art Schmidt	Alaska Department of Fish and Game Sport Fish Division
	Jim Clare	Alaska Department of Environmental Concerns
	Lynn McGowen	Alaska Department of Natural Resources, Divsion of Parks
	Mark Jacobs, Jr	Alaska Native Brotherhood
		Alaska Native Brotherhood
	Barbara Lewis	Alaska Native Sisterhood
		Alaska Pulp Corporation
	V.L. Eliason	Alaska Pulp Corp.
	Frank Ropell	Alaska Pulp Corp.
	Dave Lefebvre	Alaska Visitor Association
	Kathy Beauchamp	Alaska Women In Timber

Name	Organization
Jo-Ann Venneberg	Alaska Women in Timber
Robert Allen	Allen Marine Tours
Alan C. Cline	BPOE #1662
Larry Edwards	Baidarka Boats
Wayne Brown	Brownies Budget Charters
City Administrator	City & Borough of Sitka
Marlene Campbell	City and Borough of Sitka
Dan Keck	Mayor, City and Borough of Sitka
Wells Williams	City and Borough of Sitka
	City and Borough of Sitka Planning and Zoning Commission
Jeannette Konoske	Credit Bureau of Sitka, Inc.
Chuck Johnstone	Fairweather Recreation
Ben Forbes	Forbes Marine Service
D. Smith	Greentop Owners Assoc
Roger Hames	Hames Corporation
News Director	KCAW
	Kettleson Memorial Library
News Director	KIFW
Jerry Larrabee	Larrabee Logging, Inc.
Louie Howard	Moose Lodge
Don Rice	Moose Lodge

Name	Organization
Larrae Rocheleau	Mt. Edgecumbe High School
Dr. Neil Murphy	Mt. Edgecumbe Ski Group
Don Brown	Mud Bay Logging Company
	Northern Southeast Regional Aquacultural Association
Bill Peterson	Peterson's Guide & Charter Svc.
David Knapp	Rotary Club
Rich Billings	Sealaska Cruises
	Shee Atika Native Corp.
	Sheldon Jackson College
Stratton Library	Sheldon Jackson College
Sharon Hansen	Sitka Chamber of Commerce
Bill Foster	Sitka Charter Boat Operators
Al Perkins	Sitka Community Association
Margaret Calvin	Sitka Conservation Society
Richard Nelson	Sitka Conservation Society
	Sitka Conservation Society
	Sitka Daily Sentinel
Michelle Hellickson	Sitka National Historical Park
	Sitka News Bureau
Bob Kluting	Sitka Sportsmans Association
Marlys E. Tedin	Sitka State Parks Citizens Advisory Board
Bill Froust	Sitka Troll PAC

Name	Organization
Kent Hall/Beverly Minn	Sitka's Secrets
Eric Jordan	Sitka Fish and Game Advisory Committee
	Sitka Public Utility
	Sitka Snowmobile Group
	Sitka Sound Seafoods
Ken Hammons	Society of American Foresters
Pat Soderberg	Soderburg Logging & Const.
Don Soukup	Soukup Wire Rope
Frank O. Williams Jr.	President, SE Pres. Assoc.
	Southeast Alaska Regional Health Corporation
Bob Meyer	Southeast Marine
Bill Foster	Steller Charters
Commanding Officer	US Coast Guard Air Sta. Sitka
Bill Hughes	US Fish & Wildlife Service
Bob Allensworth	
Bill & Marcia Arnold	
Bruce Bachen	
Greg & Judy Buel	
Vern & Nancy Eliason	
Kenneth Hammons	
Hank Hays	
K. & M. Leccese	

Name	Organization
Tim & Donna Flink Linley	
Carollyn Loughey	
James Penny	
Lee Schmidt	
Robert Smith	
Tarleton F. Smith	
Edward Stahla	
John & Jan Straley	
Elaine & Dick Sunde	
David & Rita Tedin	
George Veneroso	
Linda Waller	
Marjorie L. Ward	
Ron Welsh	
Ron Wilbur	

Skagway

	Haines Terminal & Highway Co.
	Pacific & Arctic Railway & Navigation Company

Tenakee Springs

Don See	Alaska Native Brotherhood Camp #76
Dr. Walter A. Soboleff	Alaska Native Brotherhood Executive Committee THCC
Bob Wagner	Mayor, City of Tenakee Springs
Dianne Ziel	City of Tenakee Springs

Name	Organization
	City of Tenakee Springs
	Tenakee City Council
Russell and Grace Heath	
Molly Kemp	
Craig Mapes	
Pat Metcalf	
Robert Pegues	

Yakutat

Name	Organization
	Yak-tat Kwaan, Inc.

Arizona

Name	Organization
Jack Riggs	

District of Columbia

Name	Organization
	Advisory Council on Historic Preservation.
	American Rivers
	Army Corp of Engineers
	Environmental Protection Agency
Kenneth F. Plumb	Federal Energy Regulatory Commission
Fred E. Springer	Federal Energy Regulatory Commission, Div. of Protection
	Friends of the Earth
	Green Peace
	National Oceanographic and Atmospheric Administration.
	Office of Environmental review
	Soil Conservation Service

	Name	Organization
		U.S. Department of the Interior
		World Wildlife Fund
California	M. H. Trotter	Beyond Boundaries Expedition
		Sierra Club
Colorado		High Country News
	Charles P. Van Epps	
Florida	Michael McIntosh	The Boat Co., Ltd.
Illinois	Everett Burns	
Oregon	Rod Harder	Fur Takers of America
New York	Edwin Hall & Associates	For Echo Bay Exploration, Inc.
Utah	Jimmie Rosenbruch	Glacier Guides, Inc.
Washington		Alaska Sightseeing Tours, Inc.
	Dale A. Stirling	Heritage North
		Holland American Line Westours
	Gerald P. Smith	P.A. Adjoiners
		Royal Highway Tours
	Dr. Robert S. White	Sea Comber Excursions
	Arlene G. Dilts	Sealaska Corporation

David A. McLean	Ward's Cove Packing Co.

British Columbia, Canada

Hal McKenzie	Golden Sitka Resources

Chapter 7

Literature Cited

Chapter 7

Literature Cited

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__________. 1989b. Timber Supply and Demand. Draft 1988 Report, ANILCA, Sec. 706(a), Report 8. Alaska Region, R10-MB-55.

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Chapter 8

Glossary

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Glossary

Acronyms used in text:

ACMP	Alaska Coastal Management Program
ADF&G	Alaska Department of Fish and Game
AHMU	Aquatic Habitat Management Unit
AMS	Analysis of the Management Situation, Tongass National Forest Land and Resource Management Plan Revision
ANCSA	Alaska Native Claims Settlement Act of 1971
ANILCA	Alaska National Interest Lands Conservation Act of 1980
APC	Alaska Pulp Corporation
ASQ	Allowable Sale Quantity
ATV	All Terrain Vehicle
BLM	Bureau of Land Management
BMP	Best Management Practice
CFL	Commercial Forest Land
CFR	Code of Federal Regulations
COE	Army Corps of Engineers
CZMA	Coastal Zone Management Act of 1976
DBH	Diameter at Breast Height
DEIS	Draft Environmental Impact Statement
EIS	Environmental Impact Statement
EPA	Environmental Protection Agency
EVC	Existing/Expected Visual Condition
FEIS	Final Environmental Impact Statement
FPA	Forest Practices Act
FSH	Forest Service Handbook
GIS	Geographic Information System
GMU	Game Management Unit
IDT	Interdisciplinary Team
IPASS	Interactive Policy Analysis Simulation System
KV	Knutsen-Vandenberg Act
LTF	Log Transfer Facility
LUD	Land Use Designation
LWD	Large Woody Debris

M	Modification
MA	Management Area
MBF	One thousand board feet
MIS	Management Indicator Species
MM	Maximum Modification
MMBF	One million board feet
MOU	Memorandum of Understanding
NEPA	National Environmental Policy Act of 1969 (as amended)
NFMA	National Forest Management Act
NMFS	National Marine Fisheries Service
NOI	Notice of Intent
NPDES	National Pollutant Discharge Elimination System
NTU	Nephelometric Turbidity Unit
ORV	Off Road Vehicle
P	Preservation
PR	Partial Retention
PRIM	Primitive
R	Retention
RM	Roaded Modified
RMO	Road Management Objective
RN	Roaded Natural
ROD	Record of Decision
ROS	Recreation Opportunity Spectrum
RVD	Recreation Visitor Day
SHPO	State Historic Preservation Officer
SPM	Semi-Primitive Motorized
SPNM	Semi-Primitive Non-Motorized
TDS	Total Dissolved Solids
TIS	Transportation Inventory System
TLMP	Tongass Land Management Plan
TRUCS	Tongass Resource Use Cooperative Survey
TTRA	Tongass Timber Reform Act
USDA	United States Department of Agriculture
USDI	United States Department of the Interior
USFWS	United States Fish and Wildlife Service
VCU	Value Comparison Unit
VQO	Visual Quality Objective
WAA	Wildlife Analysis Area

Terms used in text:

Alaska Lumber and Pulp Corporation
Now named Alaska Pulp Corporation (APC).

Alaska National Interest Lands Conservation Act (ANILCA)
Passed by Congress in 1980 this legislation designated 14 national forest wilderness areas in Southeast Alaska. In section 705(a) Congress directed that at least $40,000,000 be made available annually to the Tongass Timber Supply Fund to maintain the timber supply from the Tongass National Forest at a rate of 4.5 billion board feet per decade. Section 810 requires evaluations of subsistence impacts before changing the use of these lands.

Alaska Native Claims Settlement Act (ANCSA)
Approved December 18, 1971 ANCSA provides for the settlement of certain land claims of Alaska natives and for other purposes.

Alaska Pulp Corporation (APC)
Previously Alaska Lumber and Pulp Corporation.

Allowable Sale Quantity (ASQ)
ASQ refers to the maximum quantity of timber that may be sold each decade from the Tongass National Forest. This quantity expressed as a board foot measure is calculated per timber utilization standards specified in the Alaska Regional Guide, the number and type of acres available for timber management, and the intensity of timber management. The ASQ was calculated at 4.5 billion board feet per decade for the Tongass National Forest.

Alpine/Subalpine Habitat
The region found on a mountain peak above 1,500-foot elevation.

Anadromous Fish
Anadromous fish (such as salmon, steelhead, and shad) spend part of their lives in freshwater and part of their lives in saltwater

Analysis Area
An analysis area is a planning unit made up of two or more management areas identified in the Tongass Land Management Plan. This grouping of management areas is consistent with the area analysis direction found in the 1985-86 Tongass Land Management Plan Amendment.

Appraisal
See Timber Appraisal.

Aquatic Habitat Management Unit (AHMU)
A mapping unit that displays an identified value for aquatic resources. It is a mechanism for carrying out aquatic resource management policy.

Class I AHMU: Streams with anadromous or high quality sport fish habitat. Also included is the habitat upstream from a migration barrier known to have reasonable enhancement opportunities for anadromous fish.

Class II AHMU: Streams with resident fish populations and generally steep (6 to I 5 percent) gradient (can also include streams from O to 6 percent gradient where no anadromous fish occur). These populations have limited sport fisheries values and are separate from the high quality sport fishing systems included in Class I. They generally occur upstream of migration barriers or are steep gradient streams with other habitat features that preclude anadromous fish use.

Class III AHMU: Streams with no fish populations but have potential water quality influence on the downstream aquatic habitat.

Arterial Road
A forest road that provides service to large land areas and usually connects with other arterial roads or public highways.

Beach Fringe Habitat
Habitat that occurs from the intertidal zone inland 500 feet, and islands of less than 50 acres.

Benthic Habitat
Refers to the substrate and organisms on the bottom of marine environments.

Best Management Practice
A practice or combination of practices that, after problem assessment, examination of alternative practices, and appropriate public participation is determined by a state to be the most effective and practicable means of preventing or reducing the amount of pollution generated by nonpoint sources to a level compatible with water quality goals. A BMP is not a site-specific prescription but an action-initiating mechanism which eventually leads to the interdisciplinary development of a site-specific prescription.

Buffer
Tongass Timber Reform Act requires that timber harvest be prohibited in an area no less than 100 feet of uncut timber in width on each side of all Class I streams and Class II streams which flow directly into Class I streams. This 100-foot area is known as a buffer.

Cant
A log partly or wholly cut and destined for further processing.

Clearcut
A method of regeneration cutting in which the old crop is completely cut in designated patches. Regeneration in the Alaska Region is usually natural; and the size of the clearcut area rarely exceeds 100 acres.

Collector Road
A forest road that serves smaller land areas than an arterial road. Usually connects forest arterial roads to forest local roads or terminal facilities. Collector roads are usually long term facilities.

Commercial Fishery
Fish shellfish or other fishery resources taken or possessed within a designated area for commercial purposes.

Commercial Forest Land (CFL)
Productive forest land that is producing or capable of producing crops of industrial wood and is not withdrawn from timber utilization by statute or administrative regulation. This includes areas suitable for management and generally capable of producing in excess of 20 cubic feet per acre of annual growth or in excess of 8,000 board feet net volume per acre. It includes accessible and inaccessible areas.

Standard CFL: Timber that can be economically harvested with locally available logging systems such as highlead or short-span skyline.

Nonstandard CFL: Timber that cannot be harvested with locally available logging systems and would require the use of other logging systems such as helicopter or longspan skyline.

Conveyance
The passing of the title of a property from one owner to another.

Cruise
Refers to the general activity as opposed to a specific method of determining timber volume and quality.

Cultural Resources
Historic or prehistoric objects, sites, buildings, structures, and so on that result from past human activities.

Cumulative Effects
Cumulative effects are the impacts on the environment resulting from the addition of the incremental impacts of past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such actions. Cumulative impacts can result from individually minor but collectively significant actions occurring over time.

Direct Employment
The jobs that are immediately associated with the Long-Term Contract timber sale including for example logging sawmills and pulp mills.

Dispersed Recreation
Recreational activities that are not confined to a specific place.

Draft Environmental Impact Statement
Section 102 of the National Environmental Policy Act (NEPA) requires that a statement of environmental effects for a major Federal action be released to the public and other agencies for comment and review prior to a final management decision.

Estuary Fringe Habitat
A 1,000-foot zone around an estuary.

Estuary
For the purpose of this EIS process estuary refers to the relatively flat intertidal and upland areas generally found at the heads of bays and mouths of streams. They are predominantly mud and grass flats and are unforested except for scattered spruce or cottonwood.

Even-Aged Management
The application of a combination of actions that result in the creation of stands in which trees of essentially the same age grow together. Clearcutting is an example of this type of management.

Existing Visual Condition (EVC)
The level of visual quality or condition presently occurring on the ground. The six existing visual condition categories are:

Type I: These areas appear to be untouched by human activities.

Type II: Areas in which changes in the landscape are not noticed by the average person unless pointed out.

Type III Areas in which changes in the landscape are noticed by the average person but they do not attract attention. The natural appearance of the landscape still remains dominant.

Type IV: Areas in which changes in the landscape are easily noticed by the average person and may attract some attention. Although the change in landscape is noticeable it may resemble a natural disturbance.

Type V: Areas in which changes in the landscape are obvious to the average person These changes appear to be major disturbances.

Type VI: Areas in which changes in the landscape are in glaring contrast to the natural landscape. The changes appear to be a drastic disturbance.

Fish Habitat
The aquatic environment and the immediately surrounding terrestrial environment that combined afford the necessary physical and biological support systems required by fish species during various life stages.

Floodplain
The lowland and relatively flat areas joining inland and coastal waters including debris cones and flood-prone areas of offshore islands; including at a minimum that area subject to a 1 percent (100-year recurrence) or greater chance of flooding in any given year.

Forest and Rangeland Renewable Resources Planning Act of 1974 (RPA)
Amended in 1976 by the National Forest Management Act.

Forested Habitat
All areas with forest cover. Used in this EIS to represent a general habitat zone.

Geographic Information System (GIS)
GIS is an information processing technology to input, store, manipulate, analyze, and display spatial and attribute data to support the decision making process. It is a system of computer maps with corresponding site specific information that can be electronically combined to provide reports and maps.

Habitat Capability
The number of healthy animals that a habitat can sustain.

Indirect Employment
The jobs in service industries that are associated with the Long-Term Contract timber sale including for example suppliers of logging and milling equipment.

Interdisciplinary Team (IDT)
A group of people with different backgrounds assembled to solve a problem or perform a task.

Knutsen-Vandenberg Act (KV)
This Act was passed by Congress in 1930 and amended in 1976 to provide for reforestation, resource protection, and improvement projects in timber sale areas. These funds are collected as a portion of the stumpage fee paid by the purchaser. Examples of such projects are stream bank stabilization, fish passage structures, and wildlife habitat improvement.

Land Use Designation (LUD)
The method of classifying land uses presented in the Tongass Land Management Plan (TLMP). Land uses and activities are grouped to define along with a set of coordinating policies a compatible combination of management activities. The following is a description of the four classifications:

LUD I: Wilderness areas.

LUD II These lands are to be managed in a roadless state in order to retain their wildland character, but this designation would permit wildlife and fish habitat improvement as well as primitive recreation facility and road development under special authorization.

LUD III: These lands may be managed for a variety of uses. The emphasis is on managing for uses and activities in a compatible and complimentary manner to provide the greatest combination of benefits.

LUD IV: These lands provide opportunities for intensive resource use and development where the emphasis is primarily on commodity or market resources.

Large Woody Debris (LWD)
Any large piece of relatively stable woody material having a least diameter of greater than 10 centimeters and a length greater than one meter that intrudes into the stream channel.

Layout
Planning and mapping (using aerial photos) of harvest and road systems needed for total harvest of a given area.

Local Road
A forest road that connects terminal facilities with forest collector, forest arterial or public highways. Usually forest local roads are single purpose transportation facilities and can either be long or short term in nature.

Log Transfer Facility (LTF)
A facility that is used for transferring commercially harvested logs to and from a vessel or log raft or the formation of a log raft. It is wholly or partially constructed in waters of the United States and siting and construction are regulated by the 1987 Amendments to the Clean Water Act. Formerly termed terminal transfer facility.

Long-Term Road
Roads developed and operated to provide either continuous or periodic access for long-term land management and resource utilization needs.

Management Area
An area one or more VCUs in size for which management direction was written in the Tongass Land Management Plan.

Management Indicator Species (MIS)
The following categories were used where appropriate: endangered and threatened plant and animal species identified on State and Federal lists; species with special habitat needs that may be influenced significantly by planned management programs; species commonly hunted, fished, or trapped; nongame species of special interest; additional plant or animal selected because their population changes are believed to indicate effects of management activities on other species of a major biological community or on water quality.

Mitigation
These measures include avoiding an impact by not taking a certain action or part of an action, minimizing an impact by limiting the degree or magnitude of an action and its implementation; rectifying the impact by repairing,rehabilitating, or restoring the affected environment; reducing or eliminating the impact over time by preservation and maintenance operations during he life of the action; or compensating for the impact by replacing or providing substitute resources or environments.

National Environmental Policy Act (NEPA)
Passed by Congress in 1969, NEPA declared a national policy to encourage productive harmony between humans and their environment to promote efforts that will prevent or eliminate damage to the environment and the biosphere and stimulate the health and welfare of humans to enrich the understanding of the ecological systems and natural resources important to the nation and to establish a Council on Environmental Quality. This act requires the preparation of environmental impact statements for federal actions that are determined to be of major significance.

National Forest Management Act (NFMA)
A law passed in 1976 that amends the Forest and Rangeland Renewable Resources Planning Act and requires the preparation of Forest plans.

Nonforest Land
Land that has never supported forests and lands formerly forested but now developed for nonforest uses or land with less than 10 percent cover of commercial tree species.

Notice of Intent (NOI)
Notice of Intent was submitted to indicate an intention to produce this EIS on March 1, 1990.

Operating Area
Areas within APC contract boundary area where the Forest Service designates units and roads in which timber may be cut or built to meet contract commitment.

Old-Growth Forest
Old-growth stands are characterized by trees well past the age of maturity (dominant trees exceed 300 years in age). Stands exhibit declining growth rates and signs of decadence such as dead and dying trees snags and downed woody material. Stands include trees of all ages, multilayered canopies, a range of tree diameter sizes (including very large diameter trees up to and exceeding 3 meters), and the notable presence of understory vegetation. Old growth stands are defined in the TLMP inventory as those stands having the majority of timber volume in trees more than 150 years of age.

Operating Plan
Five-year plan for logging, road construction, and related activities under Federal Government contract with the APC.

Overstory
In a stand with several vegetative layers the overstory is the uppermost layer usually formed by the tallest trees.

Pond Value
The selling value of timber without the manufacturing cost.

Potential Yield
The potential yield for the next ten years is the maximum harvest that is possible given the optimum perpetual sustained-yield harvesting level attainable with intensive forestry on regulated areas and considering productivity of the land, conventional logging technology, standard silvicultural treatments, and relationships with other resource uses and the environment.

Precommercial Thinning
The practice of removing some of the trees of less than marketable size from a stand in order to achieve various management objectives.

Recreation Opportunity Spectrum (ROS)
The framework for planning and managing the recreation resource that consists of six classes from primitive to urban. Each ROS class is defined in terms of its setting and the recreational experiences offered in that setting. Other factors including the extent to which the natural environment has been modified, the type of facilities developed, and the degree of outdoor skills needed to enjoy the area, also play a role in defining the ROS class.

> Primitive I; Includes areas out of sight and sound of human activities and greater than 3 miles from roads open to public travel and marine travelways. Provides opportunities for a high degree of interaction with the natural environment challenge risk and the use of outdoor skills.
>
> Primitive II: Area is similar in appearance to Primitive I ROS class; however, is accessible by marine travelway or is within 1/4 mile of low use trails.
>
> Semi-Primitive Nonmotorized: Includes areas greater than 1/4 mile and less than 3 miles from all roads trails or readily accessible marine travelways. Provides limited opportunities for isolation from the sights and sounds of humans and a high degree of interaction with the natural environment. Moderate challenge risk and the opportunity to use outdoor skills.
>
> Semi-Primitive Motorized: Includes areas less than 1/4 mile from primitive roads, trail, or readily accessible marine travelways. Characterized by a predominantly unmodified natural environment with minimum evidence of sights and sounds of humans. Road access is not maintained in these areas.
>
> Roaded Natural: Areas are less than 1/4 mile from roads open to public travel, major power lines, and areas of timber harvest. Areas are characterized by predominantly natural environments with moderate evidence of sights and sounds of humans.
>
> Roaded Modified: Areas are less than 1/1 mile from areas of timber harvest and transportation corridors. Areas are characterized by modified natural environment where utilization practices are common and are for purposes other than recreation.

Rural: Includes those areas with small communities, developed campgrounds, and administrative sites. These areas are characterized by substantially modified natural environments. Sights and sounds of humans are readily evident.

Urban: Areas characterized by substantially urbanized environment. The background may have elements of a natural environment. Timber harvest activities and utilization practices are common. Sights and sounds of humans predominant. Large numbers of visitors can be expected on site and in nearby areas.

Recreation Places
Identified geographic areas having one or more physical characteristics that are particularly attractive to people engaging in recreation activities. They may be beaches, streamside or roadside areas, trail corridors, hunting areas of the immediate area surrounding a lake, cabin site, or campground.

Recreation Sites
Specific locations used for recreational activities such as a specific anchorage, campsite or trail. There may be one or more recreation sites within a recreation place.

Resident Fish
Fish that are not anadromous and that reside in fresh water on a permanent basis. Resident fish include non-anadromous Dolly Varden char and cutthroat trout.

Riparian
Areas immediately adjacent to a body of water the vegetation of which is usually influenced by the water.

Road Management Objective (RMO)
Defines the intended purpose of an individual road based on Management Area direction and access management objectives. Road management objectives contain design criteria, operation criteria and maintenance criteria.

Road Prism
The area taken out of production from the top of the cut or toe of the fill on one side of a road to the top of the cut or toe of the fill on the other side of the road.

Roads, Specified
A road including related transportation facilities and appurtenances shown on the Sale Area Map and listed in the Timber Sale Contract.

Roads, Temporary
For National Forest timber sales temporary roads are constructed to harvest timber on a one-time basis. These logging roads are not considered part of the permanent forest transportation network and have stream crossing structures removed erosion measures put into place, and the road closed to vehicular traffic after harvest is completed.

Second-Growth Forest
Even-aged stands that will grow back on a site after removal of the previous timber stand.

Sensitivity Level
The measure of people's concern for the scenic quality of the National Forests. In 1980 the Tongass National Forest assigned sensitivity levels to land areas viewed from boat routes and anchorages plane routes, roads trails ,public use areas, and recreation cabins.

> Level 1: Includes all seen areas from primary travel routes use areas and water bodies where at Ieast three-fourths of the forest visitors have a major concern for scenic quality .
>
> Level 2: includes all seen areas from primary travel routes, use areas, and water bodies where at least one-fourth of the forest visitors have a major concern for scenic quality.
>
> Level 3: Includes all seen areas from secondary travel routes, use areas, and water bodies where less than one-fourth of the forest visitors have a major concern for scenic quality .

Silviculture
Forest management practices that deal with the establishment, development, reproduction, and care of forest trees.

Short-Term Road
Roads developed and operated for a limited time period and which cease to exist as a transportation facility after the purpose for which they were constructed is completed.

Slash
Debris left over after a logging operation i.e. limbs, bark, broken pieces of logs.

State Historic Preservation Officer (SHPO)
State appointed official who administers Federal and State programs for cultural resources.

Subsistence Use
The term subsistence use means the customary and traditional uses by rural Alaskan residents of wild renewable resources for direct personal or family consumption as food, shelter, fuel, clothing, tools, or transportation; for the making and selling of handicraft articles out of nonedible byproducts of fish and wildlife resources taken for personal or family consumption; for barter or sharing, for personal or family consumption; and for customary trade.

Successional Stage
One stage in a series of changes affecting the development of a biotic community. On its path to a climax stage the community will pass through several stages of adaptation to environmental changes.

Tentatively Suitable Forest Land
Forest land that is producing or is capable of producing crops of industrial wood and (a) has not been withdrawn by Congress, the Secretary of Agriculture or the Chief of the Forest Service; (b) existing technology and knowledge is available to ensure timber production without irreversible damage to soils productivity or watershed conditions; (c) existing technology and knowledge, as reflected in current research and experience, provides reasonable assurance that it is possible to restock adequately within 5 years after final harvest; and (d) adequate information is available to project responses to timber management activities.

Thousand Board Foot Measure
A method of timber measurement in which the unit is equivalent to 1000 square feet of lumber one inch thick. It can be abbreviated Mbd Mbm or MBF.

Timber Appraisal
Establishing the fair market value of timber by taking the selling value minus manufacturing costs,the cost of getting logs from the stump to the manufacturer, and an allowance for profit and risk.

Timber Entry
A term used to refer to how far into the timber rotation an area is on the basis of acreage harvested. For example, if an area is being managed for 3 entries over a 100-year rotation, the first entry would be completed when one-third (approximately 33 percent) of the available acreage is harvested (usually in 30-40 years); the second entry would be completed when two-thirds (approximately 66 percent) of the available acreage is harvested (usually 60-70 years); the third entry would be completed when all of the available acreage is harvested (at the end of the rotation).

Timber Sale Contract
Refers to the APC Long-Term Timber Sale Contract in the Supplemental EIS. The Timber Sale Contract is between the Alaska Pulp Corporation and the Forest Service and is informally referred to by many as the 50-year Contract.

Tongass Land Management Plan (TLMP)
The 10-year land allocation plan for the Tongass National Forest that directs and coordinates planning and the daily uses and activities carried out within the forest. See also Land Use Designation.

Tongass Resource Use Cooperative Survey (TRUCS)
A compilation of data on subsistence uses for evaluating the effects of the Forest Service's action contemplated in the revision of the regional Tongass Land Management Plan.

Understory
Anything growing in a stratum definitely below the main crown canopy.

Understory-Colonization Stage
The stage following timber harvest when most of the colonizing tree and shrub seedlings become established. Usually 1 to 25 years.

Understory-Exclusion Stage
The stage following timber harvest when canopy closure decreases the amount of light that reaches the forest floor and is associated with a rapid reduction in understory biomass. Usually 26 to 150 years.

Uneven-Aged Management
The application of a combination of actions needed to simultaneously maintain continuous high-forest cover, recurring regeneration of desirable species, and the orderly growth and development of trees through a range of diameter or age classes to provide a sustained yield of forest products. Group and individual tree selection are examples of this type of management.

Value Comparison Unit (VCU)
These areas which generally encompass a drainage basin were established in the Tongass National Forest to provide a common set of areas where resource inventories could be conducted and resource interpretations made.

Visual Quality Objectives (VQOs)
Measurable standards reflecting five different degrees of landscape alteration based upon a landscape's diversity of natural features and the public's concern for high scenic quality. The five categories of VQOs are:

> Preservation:
> Permits ecological changes only. Applies to wilderness areas and other special classified areas.
>
> Retention:
> Provides for management activities that are not visually evident; requires reduction of contrast through mitigation measures either during or immediately after operation.
>
> Partial Retention:
> Management activities remain visually subordinate to the natural landscape. Mitigation measures should be accomplished within one year of project completion.
>
> Modification:
> Management activities may visually dominate the characteristics landscape. However activities must borrow from naturally established form line color and texture so that its visual characteristics resemble natural occurrences within the surrounding area when viewed in the middleground distance.
>
> Maximum Modification:
> Management activities may dominate the landscape. Mitigation measures should be accomplished with five years of project completion.

Volume
Stand volume based on standing net board feet per acre by Scribner Rule.

Volume Class
Volume classes are used to describe the average volume of timber per acre in thousands of board feet (MBF). Following are the seven volume classes and the range of volume each contains.

> Volume Classes I to 3: Less than 8 MBF/acre (cleared land seedlings or pole timber stands).
>
> Volume Class 4: 8 to 20 MBF/acre.
>
> Volume Class 5: 20 to 30 MBF/acre.
>
> Volume Class 6: 3 0 to 50 MBF/acre.
>
> Volume Class 7: 50+ MBF/acre.

V-notch
A V-shaped stream channel generally on steep mountainous terrain.

Watershed
The drainage area of a stream.

Wetland
Those areas that are inundated by surface or groundwater frequently enough to support vegetation that requires saturated or seasonally saturated soil conditions for growth and reproduction.

Wilderness
An area established by the Federal Government and administered either by the Forest Service National Park Service Fish and Wildlife Service or Bureau of Land Management in order to conserve its primeval character and influence for public enjoyment under primitive conditions in perpetuity.

Wildlife Analysis Area (WAA)
Alaska Department of Fish and Game administrative designation of and area that includes one or several Value Comparison Units (VCUs) for the purpose of regulating wildlife populations and reporting harvests.

Wildlife Habitat
The locality where a species may be found and where the essentials for its development and sustained existence are obtained.

Windthrows
Areas where trees are uprooted, blown down, or broken off by storm winds.

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